INTERNATIONAL ABSTRACTS OF SURGERY

VOLUME 83 AUGUST, 1946 NUMBER 2

COLLECTIVE REVIEW

THE TREATMENT OF UNUNITED FRACTURES OF THE NECK OF THE FEMUR

RUDOLPH S. REICH, M.D., F.A.C.S., Cleveland, Ohio

THE various methods of internal fixation that have been employed in the treatment of recent fractures of the neck of the femur have greatly improved the end results, as has been attested by the numerous reports in the literature. In spite of the great advances which have been made in the treatment of these recent fractures, a great many cases still go on to nonunion. Coincident with the added interest in the treatment of recent fractures has come greater attention to the treatment of ununited fractures. Any discussion of the fracture of the femoral neck is synonymous with the name of Whitman, who not only gave great impetus to the treatment of recent fractures of the neck of the femur, but also to the old ununited fractures.

The various operations advocated for the relief of ununited fractures of the neck of the femur may be roughly divided into two categories: (1) those procedures which are designed to restore anatomical and physiological relationships of the hip joint, and (2) reconstruction procedures which provide a substitution method and aim to restore functional rehabilitation of the hip. Albee's dowell pin graft method was probably the pioneer procedure in the achievement of anatomical and physiological restoration, and the other operations, such as those described by Gallie and Lewis, Dickson, Compere and Lee, and Magnuson and King, may be considered modifications of the original Albee method in which additional bone grafts or metal internal fixation are introduced with a bone graft. It is obvious that all these procedures involve protracted and extensive operative techniques, and since a large majority of the ununited fractures occur in older people, such operations cause a severe strain and are often shocking to the patient. These methods have definite advantages. When successful, they do achieve the greatest amount of restoration of hip joint movement and a minimum amount of shortening; all require long periods of immobilization, usually in a hip spica cast.

The reconstruction type of operation has attracted considerable attention in recent years, and has become the more popular type of operation because of its greater simplicity and, in some instances, its less extensive operative technique. The reconstruction type of operation may again be subdivided into two classes, and the classification is dependent upon the condition of the ununited femoral head. This classification has been described by Colonna. It includes (1) cases in which there is a viable head, and (2) those in which there is aseptic necrosis or arthritis of the head. In those individuals in whom the ununited head has undergone aseptic necrosis or arthritic change, the choice of the surgical procedure must take into consideration the removal of the head, with one exception. The operations of Whitman and Colonna are admirably suited for these conditions and are widely used. Because of the fact that the Colonna operation attempts to implant the greater trochanter into the acetabulum, less shortening ensues, and for this reason the operation has become increasingly popular. Many excellent results have been reported in individuals upon whom this operation has been performed.

As an alternative for those patients with an ununited fracture in which there is a nonviable

head, the surgeon has the option of resorting to the Gill procedure. He has recommended the employment of arthrodesis of the hip joint in certain individuals for ununited fractures of the femoral neck in which any reconstruction procedure may be destined to failure. Such an arthrodesed hip joint achieves a stable, painless, weight-bearing member, even though it is stiff, and may be preferable in some individuals in whom stability is a very important requisite for recovery.

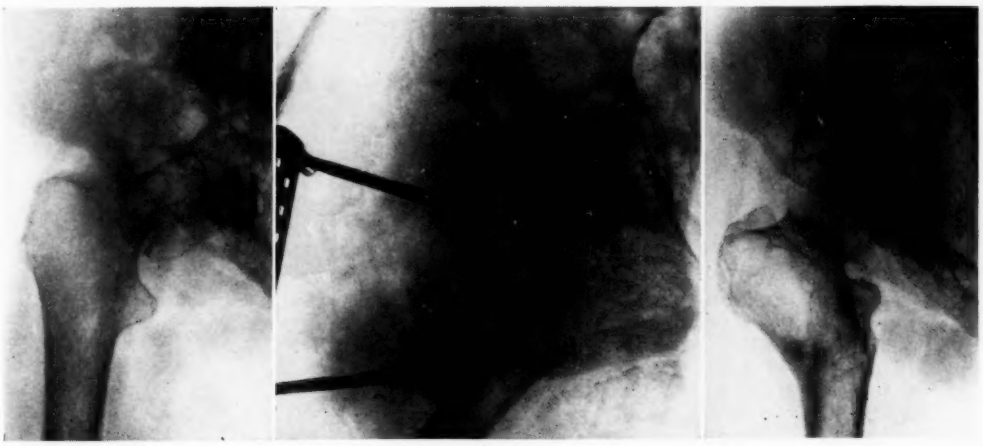
In considering the methods of treatment of ununited fractures of the neck of the femur in patients who have a viable head, the surgeon has the option of employing one of the operative procedures designed to achieve anatomical and physiological restoration, or of employing the reconstruction procedure. Various types of osteotomies have been widely employed with excellent results. The Lorenz and Schanz osteotomies have been modified until these procedures have become greatly improved and simplified. Hass described the application of the Lorenz bifurcation operation, particularly as it pertains to ununited fractures of the femoral neck. The object of the original Lorenz and Schanz osteotomies was the attempt to overcome lateral stress of the fractured femoral neck on the head, so that the distal portion of the neck would assume a position inferior to the head, instead of lateral to it, thereby eliminating the shearing force of the neck and trochanter on the head. In the original operation, it was considered that a good result had been obtained merely when this shearing force was overcome and the head was resting directly on the ununited distal portion of the neck. These operative procedures entailed considerable sacrifice of length and, in spite of the fact that there was greater stability in the hip joint, some of these individuals continued to have pain and restriction of movement with resultant functional impairment and disability.

There have been many modifications of the osteotomy, but the McMurray type of high oblique osteotomy has been by far the greatest advance in the treatment of ununited fractures of the femoral neck. When this type of osteotomy was performed, it was found that not only had the operation completely overcome the shearing force of the neck on the head, but also that union of the osteotomy surfaces, and, in a great number of instances, between the ununited head and neck, had been achieved. As a matter of fact, a great number of cases have been reported in which union has occurred following oestotomy even as late as 2 years after the occurrence of the original fracture. As a consequence, there was also less sacrifice of length of the leg than in the Lorenz and Schanz procedures.

Because of these improvements, the criteria for good end results have been completely revised. A good end result now implies complete correction of the shearing force of the neck on the ununited head, with union of fragments, less shortening, a remarkably increased range of motion, very little pain or discomfort, and a surprising restoration of function. The reports from many sources indicated a marked reduction in the mortality rate, no postoperative shock, almost no postoperative infection, and a minimal period of disability. As a consequence, the percentage of good end results from the McMurray type of osteotomy has been reported to have increased over that of the many other procedures which had been advocated.

Since the osteotomies have all been considered more or less "blind" or subcutaneous operations, difficulty was encountered in gauging the proper level of the osteotomy. The high oblique osteotomy has been preferable because it was designed to impinge the neck directly under the head so that the weight-bearing alignment would follow directly downward from the head into the shaft, completely shunting off the angle of the neck of the femur. The object of the high osteotomy, as reported by McMurray, has been to attain better apposition of the ununited fractured surfaces, and it is believed that the attachment of the muscles to the lesser trochanter greatly assisted in drawing the distal fragment medially, and maintaining this apposition. It is therefore advisable, if possible, to direct the osteotomy above the level of the trochanter, as advocated by McMurray. In spite of careful planning of the site for the osteotomy, some osteotomies have been done either too high or too low, resulting in failure of this operation. The writer suggested the insertion of the Steinman pin or drill at the proposed site of the osteotomy, and checking the hip roentgenographically before the osteotomy was finally performed.

Leadbetter's recent cervical-axial operation for ununited fractures of the femoral neck is unquestionably a great advance in the treatment of this condition. This operation completely eliminates the "blind" phase of the osteotomy by presenting a very simple exposure over the site of the ununited femoral neck, and permits performance of the osteotomy directly through the desired site. By visualizing the area one can correctly gauge the level for the osteotomy, thus achieving even less sacrifice of length than in other procedures. At the same time, the surgeon more easily implants the distal fragment under the



a b c

Fig. 1. A, Ununited fractures of the femur 4 months following fracture. B, Same patient as in A, showing position of fracture ollowing a ow Schanz osteotomy, with Schanz screws and Riedel plate in place. C, Same patient. Roentgenogram 1 year following Schanz osteotomy, showing solid bony union of ununited fracture. Result excellent. Patient climbs stairs and laces shoes without difficulty. (Schumm, H. C.: *J. Bone Surg.*, *1937*, 19: 955.)

head and neck, and thus observes the exact position that has been accomplished.

In his consideration of the osteotomy, Leadbetter has very succinctly catalogued six criteria for an ideal osteotomy, namely:

1. Preservation of the articulation of the head and the acetabulum.
2. Establishment of a normal acetabular thrust.
3. Creation of positive pressure by a true valgus.
4. Allowance for contact of cancellous bone surfaces.
5. Preservation of adequate circulation.
6. Production of minimal shortening.

The Brackett operation also was designed to implant the remnant of the neck or trochanter into the femoral head by visualization through operative exposure, and Ghormley recently reported a series of patients on whom this reconstruction procedure was employed with good results. Some surgeons consider the Brackett operation somewhat similar to the Leadbetter procedure. The ununited fracture is exposed by open operation and after the greater trochanter has been divided by osteotomy, the remnant of the neck or trochanter is implanted directly into the ununited fractured head which has been freshened and slightly gouged out.

Blount has advocated the use of a blade-plate as a means of internal fixation following femoral osteotomies, for the purpose of eliminating the necessity of the application of the hip spica cast. He considers the hip spica a distinct detriment to the patient's welfare because of the enforced period of recumbency, and the application of a blade permits more rapid convalescence and earlier weight bearing and locomotion.

DISCUSSION

The selection of the proper type of operative procedure for the relief of ununited fractures of the neck of the femur is dependent upon many factors, and the state of the ununited femoral head is extremely vital in its selection. Whether the head is viable or not is, of course, of first consideration in the selection of the proper procedure. If the head has undergone aseptic necrosis or secondary arthritic change, one must immediately eliminate all types of operations designed to restore anatomical and physiological function. Any type of osteotomy is also contraindicated. The choice of operative procedure lies between arthrodesis of the hip joint, as recommended by Gill, or the Whitman reconstruction operation in which a portion of the trochanter and neck is implanted into the acetabulum after the removal of the necrotic head, with the trochanter transplanted downward, or the Colonna operation, in which the greater trochanter is directly implanted into the acetabulum after the removal of the head.

In those instances in which the original fracture of the femoral neck has occurred far medially at the junction of the head and the neck, leaving

a b c

Fig. 2-A, Roentgenogram taken January 16, 1940 showing fracture of neck of femur with coxa vara of 6 weeks' duration. B, Roentgenogram taken April 6, 1940, of high oblique osteotomy, showing coxa vara completely corrected with lesser trochanter directly under head. C, Roentgenogram taken August 17, 1940 showing union of osteotomy and femoral neck, head and trochanters in excellent relation to shaft. (Reich, R. S.: *J. Bone Surg.*, 1941, 23: 141.)

a small remnant of the head in the acetabulum, even though viable, the various osteotomies may also be contraindicated, because of the lack of adequate purchase of the neck on the remaining head. Failures have frequently resulted from the osteotomies in which these conditions have prevailed. For this reason, such a small remaining head, even though viable, may also be considered additional indication for the Whitman or Colonna operation. A very small remnant of the head may also be considered a contraindication for the dowell bone grafting operation, particularly if it is associated with a short neck, as the operation may result in a very marked restriction of motion of the hip joint, even though the bone grafting operation may be successful.

Fortunately, by far the largest proportion of instances of ununited fractures of the femoral neck are those in which the head is viable, and on which there is a small portion of the neck attached. In this group, the selection lies between the dowell bone grafting operation designed to restore anatomical and physiological relation, and the osteotomy employing either the original Lorenz or Schanz procedures, or the McMurray type of operation with the further improvement as recommended by Leadbetter. All of these procedures require immobilization of the operated hip by means of the application of a hip spica.

Despite the fact that a great many very satisfactory results have been reported following the employment of the high osteotomy, there have been a number of instances in which the operation has been unsuccessful. It may be well to review the causes of these failures:

Improper selection of the level for the osteotomy. If the level has been selected too high, it is difficult to maintain the distal osteotomy fragment under the head and proximal portion of the osteotomy. In some instances the osteotomy has slipped. If the osteotomy has been too low, difficulty may be encountered in maintaining the distal portion of the osteotomy under the head, and union between the head and the distal portion of the osteotomy may not occur. Both these difficulties may well be obviated by the employment of the Leadbetter cervical-axial operation.

Loss of joint motion. This may be due to the fact that the ununited head may not have been viable, or to the fact that there may have been early aseptic necrosis, or that osteoarthritis may not have been detected. In these instances restriction of motion may result. The osteotomy appears to stimulate revascularization of the hip joint proper, and osteosynthesis (Wilson).

It has been the writer's experience that in some patients on whom an osteotomy had been performed, and the ununited head had shown questionable viability, later roentgenograms showed definite improvement in the bone density of the femoral head, with consequent union, probably the result of revascularization.

a b c

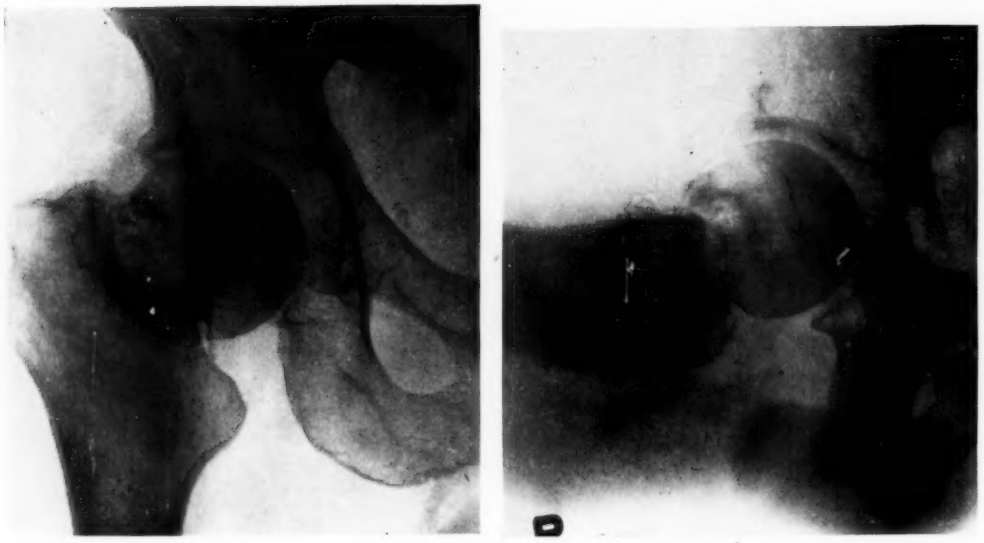
Fig. 3. A, An ununited fracture of the femoral neck of 14 months' duration in a patient 65 years of age. B, Four weeks after operation. Note the high level of the osteotomy, the valgus position with positive thrust, and the moderate degree of abduction. C, Ten weeks after osteotomy the firm and stable position is noteworthy. The patient is bearing weight at this time. (Leadbetter, G. W., *J. Bone Surg.*, 1944, 26: 713.)

The fibrous union between the surfaces of the ununited fracture has become so dense that the fragments have not become separated, thus preventing direct contact between the distal osteotomy surface and the proximal fragment of the neck and head. This difficulty in separating the fragments has been clearly demonstrated in the cervicoaxial procedure of Leadbetter, and must be considered an extremely important advantage in the open operation. It has been proved that the earlier the osteotomy has been performed after the nonunion has been established, the better the end results have been, because of less dense fibrous union. There is another distinct advantage in performing the osteotomy early, and that is that less shortening may have resulted, so that the osteotomy may be done at a higher level.

Blount lays considerable emphasis on the fact that the application of a hip spica cast constitutes a direct hardship to the patient, and recommends fixation of the osteotomized fragments by means of a blade-plate. He also calls attention to the fact that there is resultant stiffness of joints, particularly of the knee joint, following immobilization in a hip spica cast. In his opinion, it is important to fix the osteotomized fragments by internal fixation in order to prevent slipping, which he states may occur even in a properly applied hip spica. The high oblique osteotomy is the procedure of choice of most orthopedic surgeons; consequently this operation has been performed on a great many individuals, and the hip spica has not been in any way detrimental to the patient's welfare. The operation is so designed that the hip spica does not cause any strain upon the knee joint capsule. In addition, this cast rarely remains applied for longer than a 6 weeks' period, and in many instances only 4 weeks, so that there is very little opportunity for any ill effects to result from its application, either as a debilitating factor, or as a cause of joint stiffness, particularly to the knee joint.

It is needless to say that the application of any type of internal fixation following an osteotomy entails extensive operative technique which cannot help but be shocking to those unfortunate individuals who, in most instances, are not only of advanced age, but have become debilitated because of a long period of disability.

We must not lose sight of the fact that this type of operation, in addition to its very complicated operative technique, involves the use of



a b

Fig. 4. A and B, Anteroposterior and lateral v ews of right hip show an ununited fracture of the femoral neck of 1 year's duration. The Trendelenburg sign was positive on the right and negative on the left.

a blade-plate, which necessitates, in addition, the insertion of a number of bone screws. All these obviously constitute the application of a number of foreign bodies which are potentially productive of postoperative infection. On the other hand, the high oblique osteotomy is a simple procedure which can be performed in a very short time, with minimal tissue trauma and consequent hemorrhage, and there is no ensuing shock even after the application of the hip spica. The same may be said of the Leadbetter operation, which also can be carried out rapidly, with minimal tissue trauma and hemorrhage, and no shock.

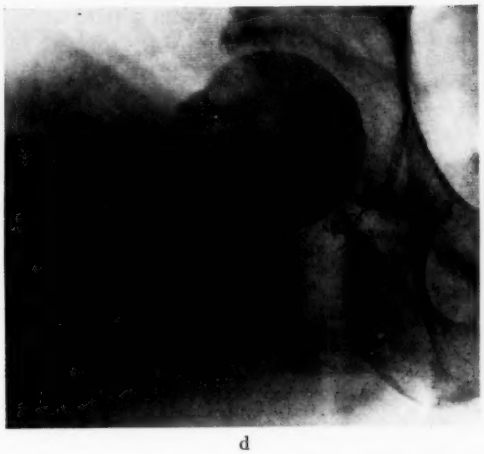
In the opinion of the writer, there is another contraindication to any type of internal fixation following an osteotomy. It has been frequently observed that the distal portion of the osteotomy is apt to wander farther inward under the head and proximal portion of the neck a few days after the osteotomy has been performed, during the process of absorption of the osteotomy surfaces preliminary to osteogenesis. This is due to the pull of the muscle attachments to the lesser trochanter, and constitutes a decided advantage in that the distal portion of the osteotomy rests further under the head and thereby contributes to a more adequate weight-bearing alignment. This obviously cannot occur when the fragments have been locked by internal fixation. Blount has stated that internal fixation is considered necessary to maintain the position of the fragments of the femur following osteotomy, and thereby prevent slipping. This might well be true for any type of low osteotomy, particularly the Schanz osteotomy, but does not prevail in any high type of osteotomy. It is extremely rare that the osteotomy fragments alter their position after the distal portion has been adequately aligned under the head, and if there is malalignment of the fragments, this condition must be ascribed to faulty operative technique. In the writer's opinion, the only contraindication to a hip spica following an osteotomy would be in the case of an individual with an arthritic knee joint, with impending ankylosis, or in whom such ankylosis may result from prolonged immobilization, in which instance a blade-plate may be indicated.

In comparing the high with the low osteotomy, it is observed that some surgeons prefer the low Schanz osteotomy to the high. The writer believes there are definite disadvantages in the use of the low osteotomy as recommended by Schanz:

1. There is necessarily a greater sacrifice of length because it entails the excision of a wedge-shaped portion of the femur.

2. It requires a greater angle and consequently a longer lever arm both above and below the angle. These features contribute to additional

c



d

Fig. 4. C and D, Anteroposterior and lateral views of right hip 1 year after osteotomy with blade-plate fixation. (In recent cases an additional screw has been used in the proximal fragment.) The patient began to walk with crutches 8 days after the operation, and eft the hospital on the twelfth day. Full weight bearing was possible in 8 weeks. He returned to farm work in 14 weeks. The Trendelenburg sign was negative. (Blount, W. P.: *J. Bone Surg.*, 1943, 25: 319.)

shortening. Because of the location of the osteotomy it is more difficult to maintain the osteotomy fragments in position, and for this reason some form of internal fixation is essential.

3. Because of the fact that there is a greater angle at the site of the osteotomy, greater obliquity in the weight-bearing line of the lower extremity, with a greater incidence of knock-knee deformity, must ensue. The knock-knee deformity also occurs in some instances in which the high osteotomy has been performed, but not as frequently as in the low osteotomy. In some instances supracondylar osteotomies have had to be performed secondarily in order to correct the knock-knee deformity.

SUMMARY

All individuals with ununited fracture of the neck of the femur may be divided into two groups, and the choice of operative procedure depends upon the group in which the patient may be classified: (1) those patients in whom the ununited head has undergone aseptic necrosis or secondary arthritis; and (2) those patients in whom the head is viable and in whom there is a remnant of the neck attached to the head.

For the first group, the surgeon has a choice of performing an arthrodesis of the hip joint, as recommended by Gill, or of performing the reconstruction operation, as described by Whitman and Colonna. For the second group, in which the head is viable, the condition may be relieved by the Albee bone grafting operation, or a modification of this procedure by the insertion of internal fixation in addition to the bone graft. The alternative is to perform one of the various types of osteotomies that have been recommended. The high oblique osteotomy has proved to be by far the most satisfactory and the simplest procedure to carry out; and the Leadbetter cervical-axial osteotomy has greatly simplified the operative procedure and has completely eliminated the so-called "blindness" in the selection of the site of the osteotomy. The blade-plate fixation of the osteotomy fragments entails an extensive operative procedure no less shocking and difficult than the bone grafting type of correction. The application of the hip spica cast following an osteotomy results in no difficulties to the patient, as it remains applied for a maximum of 6 weeks and the patient may be moved the day following the operation. It may consti-

tute a contraindication in a patient with an arthritic knee, in which instance the application of internal fixation, such as a blade-plate, may be preferable.

The criterion for a good end result has been materially altered since the high oblique osteotomy. Whereas, in the early cases, stable weight-bearing of the hip was considered a good result, now the objective is healing of the nonunion together with the osteotomy surfaces, and painless adequate joint motion, with a minimum of shortening.

BIBLIOGRAPHY

1. Albee, F.H. Ann. Surg., 1915, 62: 85.
2. Idem. Orthopedic and Reconstruction Surgery, Industrial and Civilian. Philadelphia: W. B. Saunders Co., 1919.
3. Blount, W. R. J. Bone Surg., 1943, 25: 319.
4. Brackett, E. G. Boston M. & S. J., 1912, 166:235.
5. Ibid., 1925, 192: 1115.
6. Brackett, E. G., and New, M. S. Boston M. & S. J., 1917, 177: 351.
7. Camitz, H. Acta chir. scand., 1931, 68: Supp. 19.
8. Colonna, P. C. J. Bone Surg., 1937, 19: 945.
9. Ibid., 1939, 21: 701.
10. Compere, E. L.. and Lee, J. J. Bone Surg., 1940, 22: 261.
11. Dickson, J. A. Surg. Clin. N. America, 1939, 19: 1235.
12. Ettore, M. Risultati a distanza della cura delle fracture recenti del collo femorale con la osteotomia sottotranstrochanterica. Soc. Internat. Chir. Orthop., 573. (3me Congr. internat. Chir. Orthop., 1936). Bruxelles: Lielens, 1937.
13. Gallie, W. E., and Lewis, F. I. J. Bone Surg., 1940, 22: 76.
14. Gill, A. J. Bone Surg., 1939, 21: 710
15. Hass, J. Erg. Chir. Orthop., 1928, 21: 457.
16. Leadbetter, G. W. J. Bone Surg., 1944, 26: 713.
17. Magnuson, P. B. J. Am. M. Ass., 1936, 107: 1439.
18. McMurray, T. P. J. Bone Surg., 1936, 18: 319.
19. Pauwels, F. Zschr. orthop. Chir., 1935, 63: No. 2.
20. Putti, V. Presse med., 1937, 101: 1841.
21. Reich, R. S. J. Bone Surg., 1941, 23: 141.
22. Rowe, M. L., and Ghormley, R. K. J. Bone Surg., 1944, 26: 249.
23. Schanz, A. Deut. med. Wschr., 1925, 51: 730.
24. Schumm, H. C. J. Bone Surg., 1937, 19: 955.
25. Speed, J. S., and Smith, H. South, M. J., 1941, 34: 798.
26. Whitman, R. Ann. Surg., 1908, 48: 447.
27. Idem. Surg. Gyn. Obst., 1921, 32: 479.
28. Wilson, J. C. J. Bone Surg., 1940, 22: 531.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Dandy, W. E.: Arteriovenous Aneurysms of the Scalp and Face. *Arch. Surg.*, 1946, 52: 1.

Although between 200 and 300 aneurysms of the scalp and face have been reported, they are very rare in the experience of the individual surgeon. Those occurring in the scalp and face are more common than those arising elsewhere in the integument. Nine cases are reported here, including 1 from the clinic of Blalock. Six of the 9 cases reported belong to a rare group in which the primary arteriovenous aneurysm was in the dura and the extracranial aneurysm arose from numerous perforations of the bone from branches of the dural aneurysm. Five of these cases also presented intracerebral aneurysms, as was demonstrated by a right homonymous hemianopsia; the intracerebral aneurysm, in turn, was connected with the middle meningeal arteries, and these were regarded as the point of origin.

The 9 cases were operated on and full case reports are appended with diagrams and illustrations to aid in the understanding of the underlying mechanisms. Only 1 case was considered to be of traumatic origin, the others being regarded as congenital. It was clearly shown in 7 cases that the arteriovenous aneurysm of the scalp derived its arterial component from the middle meningeal artery coming through the skull. These cases can be divided into two groups: (1) in which the preformed genuine arteries come through the skull and enter a primary congenital angiomatous mass, and (2) in which numerous thin-walled vessels penetrate the skull and form an arteriovenous bed without a primary angiomatous mass in the scalp. Both types are likely to derive a bilateral arterial supply from the middle meningeal arteries. In all but 2 cases the aneurysm was in the parieto-occipital region. In 5 cases the right and left middle meningeal arteries were about equally enlarged, and the hemianoptic defect was always unilateral. This was taken to indicate that the intracerebral aneurysm was unilateral as the intracerebral lesion was partly exposed at operation in only 3 cases. The size of the extracranial aneurysm was believed to be inversely proportional to the intracranial.

Headaches, dizziness, noises in the head, and a pulsating mass were the reasons for which the patients presented themselves for medical attention. Only 4 had convulsions but these do not necessarily signify intracranial extension of the aneurysm because other congenital lesions may be present and may be contributory.

The author then summarizes the various methods of surgical treatment. It is said to be doubtful whether ligation of any of the large arteries in the neck can produce anything but temporary improvement. The exception is, of course, in the aneurysms of the eyelid and face in which ligation of the internal and external carotid arteries on the affected side is indicated. Ligation of the scalp vessels is useless. The intracerebral aneurysm cannot be adequately managed. It is recommended that one or both middle meningeal arteries be tied and that the scalp lesion be attacked directly. Bone flap operations are absolutely contraindicated on account of profuse bleeding from enormous vessels. Removal of bone can be accomplished only piece by piece with the bone biters and the immediate application of large quantities of bone wax. Most of the patients were very much relieved following extirpation. There were no deaths.

This comprehensive article is one of the last of Dandy's voluminous and far reaching contributions to the surgical literature before his untimely recent death. ADRIEN VER BRUGGHEN, M.D.

Dingman, R. O.: Ankylosis of the Temporomandibular Joint. *Am. J. Orthodont.*, 1946, 32: 120.

The author presents a résumé of the incidence, effects, and pathology of temporomandibular joint ankylosis. The disease itself is quite amenable to surgery, but if it is allowed to go untreated, it interferes with mastication and nutrition, prevents proper oral hygiene, and precludes the possibility of proper dental care. In children it leads to maldevelopment of the mandible with attendant speech defects. Occasionally such disease will have serious consequences in that an acute surgical disease of the mouth or esophagus will be comparatively inaccessible.

The disease is more common in males. It occurs at any age, although usually in a younger individual and more commonly on only one side. Pathologically, true temporomandibular ankylosis is an intra-articular disease which commonly follows trauma or infection. This disease may also be simulated by a false ankylosis due perhaps to scar contractures around the region of the joint, bony tumor, or depressed zygomatic fracture. The pathology is usually much the same, notwithstanding the different etiology. It consists essentially of destruction of the articular surfaces, fibrosis of the capsule and ligaments with subsequent ossification, obliteration of the joint cavity, and joint fixation. It may be due to congenital causes, which in the author's experience were very rare, or mechanical causes, which include fractures, dislocations, chronic osteoarthritis, and suppurative processes in and around the joint (the ear, parotid gland, skull, or mandible); or it may be the result of a metastatic infection. The diagnosis is

generally made on the basis of a long standing history of restricted ability to open the mouth, usually dating from some injury or infection. If the disease starts in youth, generally there is maldevelopment of the lower jaw with a flatness of the face of the uninvolved side. There is a shift of the mandible to the involved side on opening the mouth and some crepitation upon palpation over the joint.

The author suggests anteroposterior and semilateral stereoscopic x-ray studies. In the treatment of these cases surgery is so uniformly successful that it should be resorted to in all cases.

Dilators, exercisers, or instruments for forceful opening are either ineffective or useless.

The author then presents his operative procedure which he does under local anesthesia whenever possible. He closes the operative wound in layers with drainage. Bilateral operation is usually done in two stages with a 4 to 6 weeks' interim.

He believes that the insertion of any type of foreign material, such as metals, acrylics, and heterografts, is to be condemned and that the operative hematoma will give rise to sufficient fibrous tissue in the affected region. LOUIS T. BYARS, M.D.

Inclán, A., Jr.: The Use of Haynes' Maxillary Splint in a Case of Grafting of the Mandible. (Uso de la férula de Haynes en un caso de injerto óseo del maxilar inferior). *Cir. ortop. traumat.*, Habana, 1945, 12: 132.

Since March, 1944 external splinting has been used in the orthopedic service of the author. The Zimmer splint was first used, but, later on, the Haynes splints were employed. At present both types are used and combined according to the requirements of each case. In the case here presented, the Haynes splint was used in the reconstruction operation of the inferior maxilla by bone grafting; the loss of substance was due to a large surgical exeresis of the portion between the symphysis and the angle, which was done elsewhere because of a tumor of the lower jaw. Up to the present time there has been no evidence of recurrence or metastasis.

The Haynes splint is made of screws that are introduced in the bones and connecting bars which fix the screws and permit a high degree of adaptation in various positions.

In the present case it was decided to employ a bone graft 8 cm. long that had been taken from the posterior segment of the 10th rib. Two screws of the splint were introduced into the ascending ramus, 2 in the costal graft, and 2 in the body of the maxilla on the opposite side; all the elements were fixed by means of their connecting bars. No internal fixation, whatsoever, was used and immobilization was maintained for 15 weeks; at the end of this time fusion was present.

The Haynes splint has the advantage of permitting the mastication of soft foods and oral hygiene, both of which are impossible when wires are used to fix the inferior maxilla to the superior one. Furthermore, when the bone defect is of such extent as the one presented, the Haynes splint permits a degree of fixation which cannot be obtained and maintained by the ordinary methods of fixation.

The clinical history of the patient, corresponding roentgenograms, and details of the operation are given. Fixation by wires on the uninvolved side, to insure good occlusion, was done before the operation. A week after the operation the occlusion wires were removed to permit the mastication of soft foods. Fifteen weeks postoperatively the splint was removed and the graft was firmly fused. The patient has been seen recently (165 days postoperatively); he is in good condition and ready for a dental prosthesis.

F. F. REMY, M.D.

EYE

Stone, L. S.: Return of Vision in Transplanted Adult Salamander Eyes after 7 Days of Refrigeration. *Arch. Ophth.*, 1946, 35: 135.

The experimental results of transplanting 70 enucleated, refrigerated salamander eyes are reported. Grafts kept at freezing temperatures eventually degenerated: those kept at 8°C. degenerated if refrigerated longer than 2 days; and those kept at from 4 to 6°C. were successfully transplanted, with functional return of vision demonstrable after refrigeration for 7 days. The corneal tissue was noted to be among the best preserved of the transplanted tissues.

HUNTER H. ROMAINE, M.D.

Lyle, T. K., Cross, A. G., Simpson, J. F., and Fraser, G. A.: Dacryocystorhinostomy. *Brit. J. Ophth.*, 1946, 30: 102.

Fifty-six cases of dacryocystorhinostomy are reported, including 24 post-traumatic cases. The classical type of surgical technique was followed, being modified, however, to include those cases in which an incomplete excision of the lacrimal sac had previously been done. Contraindications were listed as follows:

(a) Previous *complete* excision of the lacrimal sac. (N.B. This can usually be determined only at operation.)
(b) Destruction of the inferior canaliculus.
(c) Obstruction of the nasolacrimal duct, due to tuberculosis, malignant neoplasm, and to most of the other causes.
(d) Atrophic rhinitis.

Of the cases which were followed up, 78 per cent were completely symptom free, 13 per cent were much improved, and 9 per cent showed no improvement. HUNTER H. ROMAINE, M.D.

Struble, G. C., and Croll, L. J.: Removal of Magnetic Foreign Bodies. *Am. J. Ophth.*, 1946, 29: 151.

In the removal of magnetic foreign bodies from the eye by the posterior route the authors emphasize the following technical points:

1. Exact localization of the foreign body, especially when it is imbedded in the choroid or retina.

After preliminary x-ray localization a lead marker is attached to the sclera at the point the foreign body is believed to lie and portable x-ray apparatus is used to confirm the position before an incision is made. This somewhat prolongs the operation but the very exact localization thus possible prevents a lateral drag on the choroid or retina, keeps bleeding at a minimum, and reduces the postoperative reaction.

2. Fixation of the globe by scleral silk sutures, one on either side of the incision results in complete control of the operative area, permits traction on the sclera while the incision is made in the sclera, and helps to prevent penetration of the choroid.

3. The sclera is divided layer by layer with a cataract knife and after it is penetrated for about four-fifths of its thickness a catgut suture is placed through each lip for eventual closure of the scleral incision. The incision is then completed down to the uvea without penetration of the latter. It should be about 6 mm. in length.

4. The hand magnet is placed in contact with the uvea and the foreign body removed through it. Foreign bodies less than 0.5 mm. in size may require that a small nick be made in the uvea to facilitate delivery. Larger foreign bodies will pass through the uvea without causing a significant tear.

5. The scleral incision is closed with the catgut sutures previously placed in the sclera.

6. A diathermic barrage is placed around the incision but not penetrating the sclera. Surface coagulation may be substituted.

Experimental studies were made on fresh hogs' eyes to determine the pull of the magnet on foreign bodies placed in the vitreous, and it was found that a pars plana approach for these was satisfactory when the foreign body lay within the "certain" or "critical" zone for the size and weight of the foreign body. Diagrams are submitted for various sized fragments and these are of considerable interest.

WILLIAM A. MANN, M. D.

Friedenwald, J. S., Hughes, W. F. Jr., and Herrmann, H.: Acid Burns of the Eye. *Arch. Ophth.*, 1946, 35: 98.

The authors state that acid burns of the eye are more benign than alkali burns. Mild burns recover regardless of the type of treatment; severe burns caused by high concentrations leave opacities, perforation, or symblepharon. Corneal epithelium is highly protective against acids and it has a buffering capacity for solutions below *p*H 4.0. Isotonic solutions of hydrochloric acid, of 0.005 normal concentration (*p*H 2.5) or stronger, or exposure to isotonic solutions of citrate-phosphate-borate buffer at *p*H 4.5 or below, produced ocular lesions.

The severity of the lesion in the cornea by acids is related directly to the protein affinity of the anion. Anions, which have a high protein affinity and protein precipitating ability, produce corneal lesions at a higher *p*H than anions with low protein affinity, but these large anions (with high protein precipitating ability) penetrate poorly through the corneal epithelium and diffuse poorly into the stroma. Such precipitation and denaturation of the proteins of the cornea account for the clinical and pathological characteristics of acid burns of the cornea

JOSHUA ZUCKERMAN, M. D.

Cutler, N. L.: A Basket Type Implant for Use after Enucleation. *Arch. Ophth.*, 1946, 35: 71.

A basket type of lucite was inserted into Tenon's capsule in 50 cases of enucleation of the eyeball.

It is the accepted opinion that a more adequately filled socket and a better functioning stump are obtained with any type of implant than without one. The basket implant was devised to provide the socket with a better grip on the prosthesis which has a stud projecting posteriorly, to grip the stump.

The lucite basket, which is fenestrated to allow for the invasion of tissue, measures 11 by 15 mm. There are three holes in the bottom, two of which are for sutures. A lucite button, 5 by 8 mm., with 0.8 mm. holes, is used to tie the sutures through. Three double armed sutures of different colors are used to permit ready identification: black O nylon, blue OO dermal, and purple coarse dermal sutures.

After the conjunctiva is dissected from the limbus and to the fornices in all directions, the rectus muscles are isolated and severed from their insertions. The conjunctival opening is enlarged nasally and temporally about 2 mm., to permit passage of the globe. The globe is grasped with fixation forceps at the tendon of the internal rectus muscle, the nerve is cut, and the prolapsed globe is freed from the oblique muscles and removed.

The basket is then placed in Tenon's capsule and sewed into place by sutures through Tenon's capsule and the conjunctiva.

No attention at all is directed to the re-attachment of the muscles.

Mattress sutures, when pulled up, cause a double imbrication, or folding of Tenon's capsule and the conjunctiva. All the sutures are carried through a lucite stud.

In the prosthesis, the stud is adjusted to fit into the depression, and the base around this stud is cut away to allow the edge of the basket to come forward when the socket is turned.

It is believed that this new type of prosthesis permits more instantaneous movement and a wider range of action. JOSHUA ZUCKERMAN, M. D.

Cassady, J. V.: Uveal Blastomycosis. *Arch. Ophth.*, 1946, 35: 84.

The author reports a case of blastomycosis of the uvea. He points out that there are two types of blastomycosis, cutaneous and systemic, and that the systemic type is fatal in 90 per cent of cases.

In differential diagnosis, the following diseases must be excluded: tuberculosis, coccidioidal granuloma, syphilis, sporotrichosis, and bromide or iodine rash. Pathologically, the picture resembles tuberculosis, including the presence of giant cells, but the

double-contoured bodies of blastomycosis are found in sections of the tissue.

A white male, 64 years of age, presented polyarthritis and discoid, discrete, scaly, elevated lesions of the skin, and severe pain in his right eye. There was a yellowish, tuberclelike nodule in the iris, and total posterior synechiae.

The Mantoux test was negative in a 1 to 1,000 dilution. Roentgenograms of bones revealed irregular areas of destruction (without reaction of the bone around the lesions) and scattered areas of consolidation in both lungs.

Histological examination revealed a dense, opaque lesion of the ciliary body and the filtration angle, exudate in the anterior chamber, anterior and posterior synechiae, and atrophy of the iris. Tubercles were seen in the deep corneal lamellae and around the canal of Schlemm. Double-contoured bodies were present throughout the mass and in the giant cells. The pathological diagnosis was blastomycotic iridocyclitis, cataract, and secondary glaucoma.

From this case of endogenous blastomycosis (Gilchrist's disease), and from other cases reported in the literature, Cassady concludes that metastatic uveitis associated with systemic blastomycosis is not rare. He suggests that if the eye is involved during the course of a fungus infection, the plasmoid intraocular fluid should be withdrawn for cytologic examination and culture.

JOSHUA ZUCKERMAN, M. D.

Mann, I.: The Intraocular Use of Penicillin. *Brit. J. Ophth.*, 1946, 30: 134.

The study of the effect of injecting solutions of penicillin (0.15 c.c. of a solution containing from 2,000 to 10,000 units per cubic centimeter) into the anterior chamber of the rabbit's eye yielded some interesting results. The *p*H of the solutions was 6.5 and all of these solutions were made up in normal saline solution. Almost immediately a coagulum formed on the surface of the iris, which began to shrink in about an hour and tended to disappear in about 4 hours. Corneal edema, conjunctival injection, and cells in the aqueous were noted. Most of this reactive aseptic anterior uveitis cleared up in 3 days, but 1 case did not show recovery for 24 days. It is believed that most of the reaction is due to impurities in the preparation available commercially; but a slight reaction was obtained when a pure sodium penicillinate was used.

In 9 rabbits 1,000 units of penicillin (0.1 c.c.) were injected into the vitreous. This was followed by an immediate localized opacity in the vitreous. From 5 to 7 days after the injection a severe exudative retinochoroiditis ensued. There was retinal and choroidal edema and exudate, edema of the papilla, and pronounced vascular changes with hemorrhage. After the seventh day all eyes but 1 appeared to be blind, with loss of reaction to light. Between the second and third week new vessels appeared from the optic disc and the picture of retinitis proliferans developed. This was combined with complete retinal and optic atrophy. Subsequently a degenerative iritis and, in some cases, cataract appeared. Histological study of these eyes revealed a complete neuroretinal degeneration followed by fibrosis and accompanied by thickening and fibrosis of the choroid. Further studies were made with practically pure sodium penicillinate. Much less was found in the way of chorioretinal reaction, and all of these eyes showed normal fundi in 3 weeks. Therefore, it appears that the serious results of injecting penicillin into the vitreous of rabbits are due not to the substance itself but to the impurities which are associated with it.

After corroborating the fact that the intravenous injection of penicillin did not result in a high enough concentration in the aqueous to be beneficial in infections of the aqueous or vitreous, a study was made on the persistence of penicillin injected into the aqueous and vitreous of normal and inflamed rabbit eyes. The material was not retained in the aqueous in sufficient strength to be effective more than 6 hours. While it disappears from the vitreous less rapidly, the destructive changes in the eye from injections into the vitreous are so severe that it would seem an unsuitable method. There was no evidence that the inflamed eyes retained the penicillin longer than the normal eyes.

Twenty-nine human eyes with perforating injuries were treated by the intraocular injection of penicillin. They were all eyes which would have been inevitably lost without such treatment. Eleven of the eyes were lost in spite of the penicillin therapy, 9 healed but were blind, 1 eye healed with a cataract, 1 regained 6/36 vision, and 1 had 2/60 vision. Of the remaining eyes, 4 recovered, 1 eye had a malignant melanoma, and 1 was removed because of pain.

It is believed from this experience that intraocular injections of penicillin are justified in severely injured or infected eyes, especially when the infection is confined to the anterior part of the eye and the penicillin does not come in contact with the vitreous.

WILLIAM A. MANN, M.D.

Summers, T. C.: Penicillin and Vitamin C in the Treatment of Hypopyon Ulcer. *Brit. J. Ophth.*, 1946, 30: 129.

Nine cases of hypopyon ulcer treated with penicillin locally and vitamin C are reported in detail.

The author has long been enthusiastic in the use of vitamin C given intravenously in daily doses of 500 mgm. The use of penicillin in these cases has impressed him as being very effective. Two hundred units per cubic centimeter were used and one drop was instilled hourly during the day and every three hours at night. In addition, atropine, heat, diathermy, and vitamin C were employed.

The penicillin is apt to cause local irritation after prolonged use and may have to be discontinued. It is suggested that routine carbolization of all corneal ulcers is not necessary, but curettage of the ulcer before the instillation of penicillin may be advantageous.

The author has the impression that the combined use of vitamin C and penicillin is more effective than the use of either alone, although no statistical evidence of this is presented.

WILLIAM A. MANN, M.D.

Prendergast, J. J.: Congenital Cataract and Other Anomalies following Rubella in the Mother during Pregnancy; a California Survey. *Arch. Ophth.*, Chic., 1946, 35: 39.

A survey is reported among Californian obstetricians, pediatricians, and ophthalmologists, of congenital defects in infants born to mothers who have had rubella during the first 3 months of pregnancy. It is suggested that transplacental transmission of the virus infection arrests the development of embryological structures in the whole body, and especially in the more important organs such as the eye and the heart, in which organs a high incidence of anomalies is reported. HUNTER H. ROMAINE, M.D.

EAR

Korkis, F. B.: Effect of Blast on the Human Ear. *Brit. M. J.*, 1946, 1: 198.

An outline of an Army otologist's views on the incidence, etiology, and types of blast injuries to the ears is given.

The high percentage of associated cochlear trauma in blast ruptures is stressed.

Infection after rupture occurs in approximately half of the cases, and usually begins within 4 days of the injury.

A half-yearly otological examination of soldiers to determine the presence or absence of blast deafness is indicated.

The prognosis is doubtful and should be guarded. Residual deafness may remain.

Routine audiometry upon demobilization is advocated. JOHN F. DELPH, M.D.

Lindsay, J. R.: Histological Observations on the Healing of Labyrinthine Fistulas in Monkeys. *Arch. Otolar.*, Chic., 1946, 43: 37.

The results which are now available from the first half of this series of fenestration operations on monkeys seem to warrant the following interpretations regarding the regeneration of bone at the fistula:

The fistula in the bony semicircular canal always closes by formation of new bone unless certain measures are carried out.

The regeneration of bone occurs rapidly from the periosteal layer and more slowly from the endosteal surface of the capsule. Complete closure may occur from either or both layers.

Attempts to prevent regeneration of the periosteal bone have resulted as follows:

1. The use of a cutaneous flap reflected from the posterior wall of the external auditory meatus without removal of the annulus tympanicus was not successful. The situation of the fistula in a concavity tends to prevent close contact with the covering flap throughout the healing period.

2. Thiersch grafts of hair bearing skin were frequently successful in preventing closure for several months, but proved to be unsatisfactory because of occasional degeneration and because of the presence of hair fragments beneath the graft, which stimulated the formation of callus and eventual closure.

3. Conjunctival grafts were used with a sufficient degree of success to warrant further laboratory investigation.

4. The use of a tympanomeatal flap according to the Lempert technique has given the best results, as indicated by the response to the test for fistula. A further report on this series, as well as on the use of a cartilaginous stopple, will be possible when histological preparations are finished.

A factor predisposing to success in the application of any covering graft or flap is the location of the fistula on a convex surface rather than in a localized concavity. Such a site may be obtained slightly distal to the ampulla when the posterior bony wall of the external auditory meatus and the rim of the annulus tympanicus are adequately removed.

The evidence suggests that any fistula remains open only by virtue of the union which occurs between the membranous labyrinth and the covering flap to the exclusion of the osteogenic tissue. The perilymphatic space always becomes separated from the covering flap, either by a layer of new bone or by the membranous labyrinth. Measures necessary to permit fibrous union between the membranous labyrinth and the covering flap have been shown to be:

1. Complete removal of bone fragments and endosteum from the fistula.

2. Preservation of the normal contour and position of the membranous canal, so that it makes uninterrupted contact with the covering flap.

Failure in union was commonly caused by allowing the bone fragments to slip between the bone and the endosteum or between the endosteum and the membranous canal, and by injuring or rupturing the membranous canal so that it became depressed or displaced. JOHN F. DELPH, M.D.

Glatt, M. A.: Xanthoma or Lipoid Granuloma of the Temporal Bone (Hand-Christian-Schuller Syndrome). *Arch. Otolar.*, Chic., 1946, 43: 110.

A case of xanthoma or lipoid granuloma occurring in the temporal bone of a 36 year old Jewish male is reported. Symptoms of headache in the left temporal region, weakness, giddiness, and tinnitus and impaired hearing on the left side came on gradually over a 5 months' period. The patient's past history was negative except for a healed pulmonary tuberculosis occurring 9 years earlier.

Local examination disclosed redness and bulging of the superior portions of the tympanic membrane and of the anterosuperior wall of the external auditory canal. Conduction deafness of mild degree was present in the affected ear and x-rays showed an

area of destruction of the upper border of the external auditory canal and the anterior contour of the petrous bone.

At operation 3 months later a greenish-brown sequestrum was removed and with it the underlying necrotic dura. The bone surrounding the affected area was irregular and densely sclerotic. Recovery was uneventful. Healing occurred without suppuration.

Histological studies showed large endothelial cells with distinct borders, relatively small vesicular nuclei, and foamy cytoplasm with multinuclear giant cells characteristic of xanthoma or lipoid granuloma.

The relation of this solitary xanthoma to the multiple lesions sometimes found in the skull, which may be associated with the Hand-Christian-Schuller syndrome, are discussed. In the presence of a solitary lesion with indefinite borders on x-ray examination, the finding of xanthoma cells in the tissues is necessary for this diagnosis. JOHN R. LINDSAY, M.D.

Jones, B. S.: Reflections on the Radical Mastoid Operation. *J. Lar. Otol.*, Lond., 1945, 60: 233.

This article deals with the author's experiences in obtaining complete and permanent resolution of the discharge after a radical mastoid operation has been performed. He believes there is no reason why every patient undergoing a radical mastoid operation should not be freed from any discharge. His experiences are discussed at some length.

NOAH D. FABRICANT, M.D.

MOUTH

Desaive, P.: Tumors of the Sublingual Glands (Les tumeurs de la sublinguale). *Rev. belge sc. med.*, 1942, 14: 178.

Tumors of the sublingual glands are rare. The Anti-Cancer Center of the University of Liege has, since 1925, received only 1 report of such a case.

The patient was a man 46 years old. His father died of cancer, probably of the digestive tract. The patient had had pneumonia in 1920. About 5 weeks prior to the first examination, he noticed an indolent oblong swelling in the floor of the oral cavity; the swelling appeared to grow rather fast. Examination revealed an oblong tumor measuring 3 by 2 cm. on the right side in the floor of the oral cavity, extending from the lingual frenulum toward the second molar. The mucous membrane was elevated and the tumor was found to be slightly adherent to the underlying muscles. Palpation of the right submaxillary region revealed no adenopathy. Diagnosis of a probable mixed tumor of the sublingual gland was made, and excision under local anesthesia was performed and followed by radium treatment. Histologic examination revealed an epithelioma of the salivary gland of cylindromatous type. No evidence of lymph gland metastasis was found. There was no evidence of recurrence for 6 years.

The author found only 17 cases, of sublingual tumors reported in the literature, 14 of which were classified as mixed tumors. Six of these 14 cases showed local recurrence after surgical excision, and in 2 of these pleuropulmonary metastases also developed.

It is impossible, by histological examination, to differentiate tumors with a benign clinical course from those with very malignant manifestations; therefore all tumors of the sublingual gland should be considered malignant. ARTHUR J. LESSER, M.D.

Weiss, L. R.: The Control of Bone Fragments in Maxillofacial Surgery. *J. Oral Surg.*, 1945, 3: 271.

The control of bone fragments in the treatment of fractures of the facial bones is vital. The success of all fracture treatment depends greatly on stability and immobilization.

Reduction and immobilization should be attained by means of the most conservative methods possible for favorable results. There are many methods of fracture reduction and fixation, some having better results in the hands of certain men than in the hands of others. Various methods may be combined and employed together for good end results.

The head bandage has a definite place in first aid or emergency treatment. It affords stabilization to a degree, and gives the patient a sense of security and a feeling that something is being done, although it is replaced by other treatment later.

The use of wire interdentally around the necks of teeth is perhaps the oldest method for jaw fracture fixation. Many methods of wire stabilization have been offered, each with its own merits and its place. The Gilmer type is one of the oldest of present day wiring techniques. From it have been evolved most present day wire fixation methods, in which the upper jaw or the lower jaw is stabilized by its opponent. The Eby-Ivy type of fixation, the Risdon type, and the Stout continuous wire loop all employ the same principles, the purpose of which is to produce lugs or loops by which intermaxillary immobilization may be accomplished, as well as direct fragment fixation. The Stout continuous wire offers a maximum number of stabilization and traction loops and eliminates sharp projecting lugs on the buccal surfaces of the teeth.

The advantages of using interdental wire over the interdental splint are: almost immediate reduction; elimination of impression taking, time consuming laboratory procedures, and the excessive time elapsing between the time of injury and fracture stabilization; and observation of the condition of the teeth at all times, to make sure that the opposing teeth are in direct occlusion with their opponents.

The gauge of wire employed in interdental fixation should not exceed 22, and, preferably, it should be 24 or 25, since unduly heavy wire, in addition to being difficult to handle and more painful to the patient on installation, causes a definite pressure atrophy of alveolar bone, irritates the interdental papillae unnecessarily, and creates a definite gingivitis.

The arch bar attached by interdental wire loops or by tooth bands may be used for stabilization.

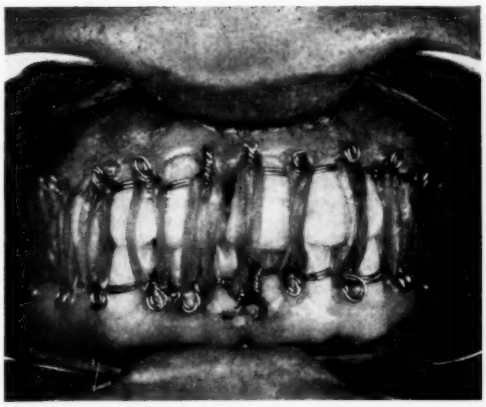


Fig. 1. Interdental wiring with intermaxillary elastic traction; double wiring applied because of ease of installation and added loop rigidity.

Another advantage of these arch bars is that they are rigid enough to withstand considerable traction and distribute an applied force in any direction over a greater area of the dental arch than would be possible with interdental wiring, the lugs themselves offering more rigidity than the ordinary wire loop. The chief disadvantage of arch wires is that their position often produces a pressure gingivitis, since it is hard to maintain them rigidly in their original position, unless the connecting wires are placed in the beginning upon the greatest constriction of the tooth.

Rubber ligature fixation is the most universally indicated and the most adaptable type of fixation. It may be used to accomplish reduction through traction, as well as stabilization. As soon as it has accomplished reduction, its only purpose is stabilization, and it should afford just that. Many fibrous unions following rubber ligature fixation can be attributed to instability, due to the ability of the patient to counteract such traction and produce movement enough to break down the primary blood clot between these fragments. Rubber ligatures in all cases of early fracture fixation should be so strong that the patient may not counteract their traction by voluntary muscular action.

Displacement of bone fragments when the mandible or maxilla is edentulous may be reduced through alveolar wiring of the individual fragments, by the extension of wire through the alveolus of one fragment to another, and by attachment directly to adjacent stable bone, or to a bridging splint or appliance. Direct insertion of wire through the alveolar process of the maxillae to stabilize an upper denture or splint in conjunction with circumferential wiring of the mandible over a denture or splint generally produces good results in edentulous cases.

Intraosseous, intraoral, and extraoral wiring are indicated in fracture of the facial bones when it is

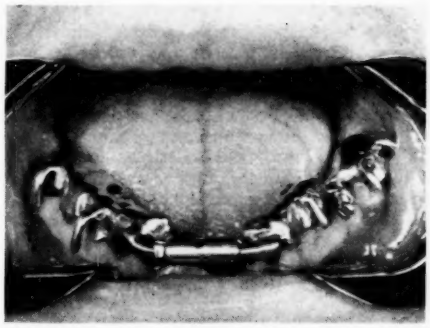


Fig. 2. Cast silver mandibular splint with turn buckle in lower incisor area to align fragments where there is collapse because of bone loss in symphysis area; screw extension to single left molar casting to maintain distal fragment.

impossible to maintain these fragments by other methods. This type of wiring is contraindicated in the presence of infection. It is especially applicable in fracture of the orbital ridges, mandible, ramus, and anterior end of the malar bone. Intraosseous wiring of fragments usually should be supplemented by added immobilization of some kind, whatever it may be, for alone it does not give sufficient support. These intraosseous wires may be removed or may remain permanently.

The cemented cast metal cap splint has been used extensively, especially in immobilization of complicated fractures. It is both adaptable and flexible. It may be used solely as a stabilizer, or in combination as a reducing appliance and space maintainer. Numerous connections and appliances may be incorporated in it to produce definite movement of the fragments to any extent or angle.

This type of splint lends itself to the treatment of a great many types of fractures. It may be altered by both intraoral and extraoral extensions. Extraoral extensions may be employed by attachment to

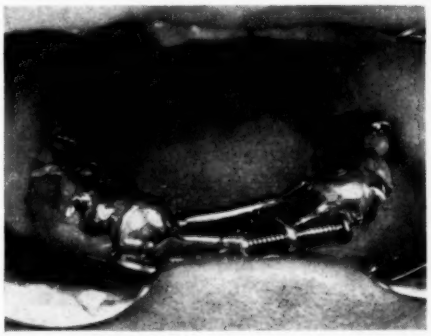


Fig. 3. Adjustable screw attachment used to control inward rotation of fragments; cast silver splint.

this type of splint without the use of a headcap. The cast splint is indicated especially for long periods of time and in case the patient may not be under continuous supervision, or when conditions make it necessary for extensive periods of time between treatment. Good oral hygiene may be maintained with little difficulty with these appliances.

The open type of splint made of acrylic or cast metal, locking in the interproximal spaces by projections from a buccal and lingual flange and hinged in the back or in the edentulous spaces with a button attachment for closure and stabilization, is often indicated when all or some of the teeth are affected because of trauma, decay, or periodontoclasia, and as a result are loose and of questionable stability.

The use of external pin fixation has been very much talked about, especially in recent years. External pin fixation has a definite place in fracture reduction and in fixation of the mandible, but it should be used only when there is no other method of obtaining satisfactory reduction and stabilization. It is indicated in cases of extreme loss of osseous tissue in the angle, in the body and angle, in the edentulous jaw, or in the bilateral condyle fracture when the mandible is edentulous.

Intraoral pin fixation has little if any value in reduction and stabilization of any type of fracture with the exception, possibly, of fracture of the angle or of the ramus of the mandible. Its great hazard is the possibility of infection and ensuing loosening of the pins.

Headcap traction as a method of producing stabilization is often indicated, and sometimes offers the only method for stabilization of the part. Attachments, extensions, and fittings of various types may be employed, the resulting traction assuring stabilization or extension in almost any direction or angle. Its stability depends on its covering the external occipital protuberance and its enveloping the mastoid process. The plaster headcap, which has stood the test of time, is very adaptable to any desired appliance, but, unfortunately, it is uncomfortable to many patients.

The greater number of fractures coming under the maxillofacial surgery department, being the result of gunshot wounds, show such loss of bone that bridging or approximation cannot be accomplished without loss of function and facial distortion. Statistics from World War I indicate that about 11 per cent of gunshot fractures result in nonunion and require bone grafting. Since, in nearly all of the author's cases, the bone was comminuted and shattered, and often became infected, some necrosis and sequestration resulted. Sequestration can be held to a minimum by early stabilization of the fragments. Immobilization should be secured by splints or appliances stable and rigid enough to withstand all muscle pull and action, as bone grafting requires absolute stability and over a long enough time for the graft to 'take' without disturbance of its position, which must be held by a rigid trouble-free appliance.

No one type of splinting for fragment stabilization in bone graft preparation can be advocated. When teeth are present, the closed cap cast interlocking pin and flange splint furnishes the desired stabilization, being attached by cement to the teeth and otherwise by interdental wires. Bone graft stabilization in the edentulous mandible is a problem that must be met entirely by the ingenuity of the surgeon. It must be accomplished entirely by extraoral fixation either from a headcap, by means of a bar, pin, or wire extensions, or by direct bar or pin fixation, the pins or bar lying far enough from the site of the graft itself not to endanger it from infection, which often results through the communication of bone with the surface of the skin by means of the pin itself.

FREDERICK W. MERRIFIELD, M.D.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

De Girardier, J.: Late Reactions following Nerve Suture with Integral Physiological Restoration of the Nerve (Dur ôle réflexogène tardif d'une cicatrice de suture nerveuse réussie avec restauration physiologique intégrale du nerf). *Lyon chir.*, 1945, 40: 33.

A 10 year old girl suffered a deep laceration just above the right elbow which severed the radial nerve and caused typical radial paralysis. The wound was treated 4 hours after its occurrence by careful cleansing and débridement, suture of the nerve ends, and primary closure. The arm was immobilized in a neutral position for 3 weeks, and after 4½ months was functionally as good as the left.

Four years later, however, symptoms suddenly appeared in the right forearm, at first intermittent, but later constant. These consisted of paralysis, paresthesias of the fingers and hand, vasomotor reaction of the skin of the hand and fingers, and a tenderness of that part of the scar directly over the nerve course. Movements of the right hand were decreased, especially wrist extension and finger flexion, and forceful movements were impossible. Finger edema was noted. Examination of the scar showed a slight swelling directly over the nerve trunk, and pressure at this point caused pain which radiated along the posterolateral part of the forearm.

Five months after these symptoms had begun a right stellate injection was performed with immediate relief of all symptoms. An acetylcholine-papaverine mixture was prescribed. Several months later, however, the neuroma again became painful and vasomotor phenomena reappeared. Soon the symptoms became as intense as during the first occurence. An injection of procaine was made at the neuroma site. This resulted in cessation of the symptoms but the relief was of short duration. It was necessary to give a stellate ganglion injection two more times, but at the time of this report, no symptoms had recurred for more than a year. When and if they reappear, a perihumeral sympathectomy is planned.

A possible relation of the reflex vasomotor reactions and other symptoms to menstruation, since the exacerbation of the symptoms began with the onset of puberty, is suggested.

C. FREDERICK KITTLE, M.D.

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Munslow, R. A.: Penetrating Head Wounds. *Ann. Surg.*, 1946, 123: 180.

The author reports his experiences with 140 cases of penetrating wounds of the brain divided into 3 groups on the basis of the tactical situation under which they were treated. The material resulted from the Italian campaign and is presented in a statistical manner.

Ninety per cent of the wounds were caused by shell or mortar fragments and only 5 per cent by small arms fire. Twelve per cent of the patients were admitted in a state of clinical shock, and in 9 of these patients the shock was attributed to the head wound, and in 3, to other associated wounds. Thirty-six per cent of all the patients had also other wounds of the body. Consciousness was preserved in 78 per cent of the patients, although the criteria for consciousness is not defined. Approximately half of the patients had a missile within their craniums upon roentgen examination; the other half had only indriven bone fragments. In 10 per cent of the patients, the paranasal sinuses were injured.

Local procaine infiltration alone of the scalp was used for débridement and repair in 64 per cent of the patients, while intravenous sodium pentothal was used as a supplementary agent in 26 per cent. The average operating time was 1 hour and 40 minutes.

The surgical treatment consisted of débridement and excision of the scalp wounds, the making of a craniectomy for exposure and débridement of the missile tract of all bone fragments, necrotic brain substance, and extraneous material. This was accomplished by use of the suction apparatus under direct vision. The author has not hesitated to use an exploring finger in the brain to search for deeply indriven bone splinters, a procedure which is indispensable if all bone chips are to be found. The author points out that very small metallic missiles within the brain do not present enough hazard of infection to warrant the destruction of brain tissue involved in their extraction.

The missile tracts involved one hemisphere in 79 per cent of the cases and both hemispheres in 21 per cent. Tracts crossing the midline resulted in fatality twice as often as those confined to one hemisphere.

Early in the campaign sulfanilamide was dusted into the débrided cerebral wounds but this was discontinued later. In the last half of the series, 10,000 units of penicillin were instilled into the clean cerebral cavity before closure of the wound. Tight closure of the dura was accomplished in half of the cases and fascia lata grafts were employed when the ventricles had been penetrated.

The sulfonamides were employed in the postoperative management for prophylaxis against invasive infection until penicillin became freely available. Then, 25,000 units were given intramuscularly every 3 hours for 5 days.

There was an operative mortality of 17 per cent. Of 109 soldiers who survived, 103 were observed in follow-up examinations, an unusually good record. Full neurological recovery had been made by most of the patients and 16 per cent had been returned to

duty status. Eighteen patients required secondary craniectomy at the Base Hospitals for various causes, 8 for late abscess.

The author's experiences and conclusions for the most part parallel those of other surgeons who have treated cranial wounds in the combat zones during the war. LAURENCE M. WEINBERGER, M. D

Rand, C. W., and Courville, C. B.: Histological Changes in the Brain in Cases of Fatal Injury to the Head. Alterations in the Nerve Cells. *Arch. neur. psychiat.*, 1946, 55: 79.

This article is one of a series dealing with the various cytological changes in the brain following injury to the head. In the total investigation, the authors have been concerned with an explanation, if possible, of the residual symptoms which often persist after head injuries, and with a study of the detailed changes in the various parts of the brain. They found that a generalized chromatolysis of the cortical ganglion cells is the usual response of the brain to severe injury. They assume this to be the histological side of the picture of "commotio cerebri," or concussion, but they do not insist that such changes are necessarily the cause of the change in the psychic realm so often seen in such injured persons. They point out also that "one should not attempt to account for temporary loss of consciousness, with restoration to the normal state in that respect within a few hours, on the basis of alterations in the nerve cells which persist for at least a month, or over."

Following acute trauma, there is a disturbance in the fluid balance of the cerebral tissues, with anatomical alterations within the cells on that basis alone, and it is the *combination* of the effect of the shock and edema that produce the cellular alterations so consistently seen in the cerebral and cerebellar cortex after acute injury. Local, prolonged pressure upon the cortex, as in a depressed fracture, may produce reversible changes if the pressure is of a moderate degree, and consists of a loss of the tigroid substance and eccentration of the nucleus. The more severe and prolonged pressure results in local degeneration, due, most likely, to regional anemia rather than to any mechanical effect. Not unless the cortex is actually bruised at the time of depression is such an injury accompanied by any marked degree of change in the cortical cells.

A review is made of the important contributions to the neuronal changes incident to severe destructive lesions of the cortex. These changes are dependent not only upon the original shock, but also upon circulatory deficiency, such as hemorrhage, edema, ischemia, and possibly some local anoxemia. Many of these same conditions exist in other pathological conditions of the brain, but in the instance of traumatic lesions multiple types of change may be found within a single cell.

The authors have evidence to support several conclusions. Cells at the site of trauma may be killed immediately or may die after a variable delay, according to their degree of direct injury and proximity to the point of greatest force. Cells outside the site of primary injury may survive, or they may, after a period of days, gradually die and fade out. They may show, therefore, either local or general effects of injury. They may live to recover from such changes as loss of tigroid substance or infiltration of hematogenous pigment. Too, some cells may survive but remain worthless to the organism's economy thereafter. Dead and "crippled" cells may become encrusted with iron (ferrugination, "calcification"), and are actually mummy cells in such a state. It is characteristic of the alterations in cells injured by acute trauma that such changes are multiple within each cell. There may be, in the same cell, the so-called "preservation necrosis of Cajal," alterations in the Golgi apparatus, infiltration of pigment, pyknosis, edema and vacuolization, ischemic changes, lipoidal degenerative changes, segmentation of the cell and its membrane, and physicochemical alterations in the cytoplasm. The tigroid substance may undergo profound loss, the neurofibrillae may show marked disintegration, and the cells may become multinucleated. There is one colored plate with the text which beautifully illustrates these various possibilities of cellular alteration.

JOHN MARTIN, M. D.

Echternacht, A. P., and Campbell, J. A.: Midline Anomalies of the Brain; Their Diagnosis by Pneumencephalography. *Radiology*, 1946, 46: 119.

Congenital cysts of the septum pellucidum and of the associated structure, the cavum vergae, are not of frequent occurrence and are always diagnosed either by pneumencephalography or by incidental finding in the autopsy specimen. The previous literature contains 15 reported cases of congenital cysts of the septum pellucidum, and the 5 cases of the authors bring the total to 21. These 5 cases were found in a total of 96 pneumencephalograms, rather a high percentage, which suggested that such developmental anomalies are frequently overlooked in the reading of such roentgenograms.

The cysts which communicate with the true ventricular system (this communication may actually be artifactual) will show with characteristic shadows in the roentgenograms, but those of the noncommunicating type will show only through their "negative" shadow and by the distortion they produce on the surrounding portion of the brain and on the ventricular shadows.

The authors report 2 cases of agenesis of the corpus callosum, a developmental phenomenon sometimes associated with changes in the septum pellucidum. This makes a total of 20 such cases reported to date in the literature.

The midline developmental defects may be associated with mental abnormality, epilepsy of undetermined origin, and other obscure neurological conditions. There is no evidence in any of the reported cases that sex is a determining factor, and the

age of the patients has varied from the time of birth to 73 years. JOHN MARTIN, M. D.

Mathewson, W. R.: Meningioma of the Tuberculum Sellae with Bitemporal Hemianopia. *Brit. J. Ophth.*, 1946, 30: 92.

The author presents a case report of a prechiasmal meningioma with typical early signs and symptoms and progression to partial optic atrophy in both eyes before surgical intervention. Associated bitemporal hemianopic field changes were found in both eyes, being more marked in the right eye in which central vision also was impaired to 6–60.

The field changes in the preoperative phase progressed typically in the temporal halves superoinferiorily, and in the reverse order postoperatively. A method for facilitating the field examination when one eye has lost fixation is described, wherein complementarily colored and green glasses on opposite eyes, a correspondingly colored test object, and a white fixation light are used.

HUNTER H. ROMAINE, M.D.

List, C. F., and Holt, J. F., and Everett, M.: Lipoma of the Corpus Callosum; A Clinicopathological Study. *Am. J. Roentg.*, 1946, 55: 125.

The corpus callosum appears to be one of the favorite sites of cerebral lipoma. The world's literature contains 30 cases involving the corpus callosum among a total of approximately 100 known examples of lipoma of the brain.

The authors report a case with a complete history, neurological examination, electrocephalograph, and roentgenograms. This case was operated upon and they give the sequence of events following the operation. A second case is also described and the autopsy findings recorded.

Even though the clinical symptomatology is not pathognomonic, the diagnosis of lipoma of the corpus callosum can occasionally be made during life by roentgenographic means. The roentgenographic signs consist of increased radiolucency of the tumor, calcification, demonstration of an expanding mass in the anterior part of the corpus callosum, and agenesis of the posterior portion of this structure.

Surgical treatment of lipoma of the corpus callosum is contraindicated. PAUL MERRELL, M. D.

SPINAL CORD AND ITS COVERINGS

O'Connell, J. E. A.: The Diagnosis of Lumbar Intervertebral Disc Protrusions. *Brit. M. J.*, 1946, 1: 122.

Posterior crural, or sciatic, and anterior crural pain are familiar symptoms. In the past the commonly accepted view has been that such pain results from an interstitial neuritis of the sciatic or anterior crural nerves, or that it is referred from lesions of the muscles, ligaments, and joints of the lower back. While the patients with milder cases recover with a variety of treatments based on these etiological hypotheses, the results of such therapy have been disappointing in the more severely affected patients. During the last 10 years much light has been shed on the etiology of these crural pains by neurosurgeons, led by Mixter (Mixter and Barr in 1934, and Mixter and Ayer in 1935).

Evidence has gradually accumulated to suggest that, at least when the symptoms are severe, their far most common cause is a lumbar intervertebral disc protrusion. The presence of anterior crural or sciatic pain should therefore immediately suggest the possibility that a protrusion of a lumbar intervertebral disc has occurred. This possibility becomes a probability if the leg pain is associated with a characteristic series of physical signs in the lumbar spine and affected lower limb.

A variety of different lesions may occasionally give rise to the syndrome under discussion. The author points out that a tumor within the spinal canal, inflammatory or malignant disease of the spinal column, and spondylolisthesis most commonly cause the described pain. He discusses the importance of a very complete neurological examination and believes that in the majority of cases the extent of a lumbar intervertebral disc protrusion can be discovered by clinical examination alone. Roentgenography usually is the only accessory method of examination that need be routine. The presence of an intervertebral disc protrusion may be revealed by narrowing of the intervertebral interval and perhaps some localized osteoarthritic change. He discusses the use of lumbar puncture with manometry and examination of the cerebrospinal fluid as an aid in differentiating between neoplasms and protrusion of an intervertebral disc.

The author then considers the indications for operation and attempts to give the essential differential points between those lesions which may cause pain. He gives the indications for operation, three aspects being considered: the severity and duration of the symptoms, the severity of the neurological signs, and the severity of the tension signs. He discusses the examination to bring out these features. He stresses that during the neurological examination it is well to remember the anatomy and distribution of the nerves so that one is able to localize the intervertebral disc protrusion and operate at the proper level.

The author states that he bases his observations upon the clinical and operative findings in a personal series of more than 220 proved cases of lumbar intervertebral disc protrusion. PAUL MERRELL, M. D.

White, J. C., and Peterson, T. H.: Lumbar Herniations of the Intervertebral Discs; the Value of Surgical Removal for Naval Personnel. *Occup. M.*, 1946, 1: 145.

Although excision of protruding intervertebral discs should give relief to patients presenting low backache and sciatica, and no additional weakness of the lumbosacral region, such is not always the result. A review of the literature covering 957 cases reveals that the results were classed as from excellent

to good in 67.58 per cent, as improved in 17.08 per cent, and as unsatisfactory in 15.33 per cent. This discrepancy is attributed to changes in the spinal ligaments, articular facets, and laminas which are overlooked even in a careful survey during operation. Relatively few articles concerned with the surgical result of this condition among military personnel have been published. The authors present 39 naval patients operated on with the removal of a definitely herniated disc. Only those who failed to respond to conservative orthopedic management after a month were submitted to surgery. Besides the neurological signs of root compression, a definite filling defect in the pantopaque spinogram was found in all but 2 of the patients. One hundred and one patients with a clinical suggestion of prolapsed intervertebral disc were examined by this method and 56 were returned for nonoperative treatment in the absence of any projection or root sheath filling defect. Two patients were operated upon after normal spinograms were observed because of their definite symptoms, elevated spinal protein, signs of root compression, and failure to respond to conservative orthopedic management. A disc herniation was present in both.

The surgical technique was constant for all operations. Subarachnoid block was the type of anesthesia used. After removal of the muscle from three spinous processes, little or no bone was removed from the contiguous laminas, but extradural removal of the herniated fibrocartilage mass was done. The interspace was then curetted to collect fragments which might subsequently become loose. In each case the adjacent vertebrae were tested for mobility, and the exposed ligaments and articulations were examined for evidence of trauma or malformation, but only one primary spinal fusion was necessitated because of such findings. Postoperative convalescence permitted these men to void while standing on the evening after operation and they were encouraged to sit and move about the next day. Generally in less than 2 weeks, with daily sitting up exercises, these patients were ambulatory. Between 1 and 4 months postoperatively they were discharged to limited or full duty. The ages of the patients varied from 20 to 54 years. Two instances of postoperative sepsis were present but they were not of major import. Some of the patients required catheterization for brief periods. One patient with an unusually large disc had preoperative bladder paralysis, but recovered normal function in 9 days after the operation.

When these patients were admitted to the neurosurgical division it was evident that unless their pain could be alleviated they would require discharge. After operation only 1 has been discharged for medical reasons although the retention in service of 7 others is uncertain. As civilians all of them should be able to do light work and not require total disability pensions. Of 24 patients whose followup extended from 5 to 30 months, 54.2 per cent (13) were classed as having excellent results, 20.8 per cent (5) as having good results, and 20.8 per cent (5) as having uncertain results; and in 4.2 per cent (1) the result was considered a failure. Therefore, 75 per cent had results both useful to the service and satisfactory to the patients. The remaining 25 per cent is composed of 2 patients who have difficulty in a limited service status, 3 who are hospitalized for further treatment, and 1 patient who is discharged from service but does light civilian work. Of the remaining 15 on whom statistics were available only up to the time of their hospital discharge, 3 were sent directly to duty, and 10 to limited duty or to a naval convalescent unit with a good prognosis. Two had uncertain results. Many men have written subsequently, enthusiastic over their sound physical condition.

Four of the 39 patients had multiple disc herniations. Most of these occurred without a history of additional trauma. There were 3 instances of recurrent pain due to further rupture of the annulus fibrosus and compression of the nerve roots at other sites, and 4 other patients suffered disability after initial successful results. Of these 7 cases, 3 were due to further disc ruptures at other sites, 3 were due to further spinal trauma, and 1 was due to failure to fuse an obviously unstable lumbosacral spine.

During the period when these 39 cases were treated there were 7 other exploratory operations made in which this diagnosis was not substantiated. Hypertrophy of the ligamentum flavum, traumatic swelling of the posterior root ganglion, and neurofibroma of the cauda equina were lesions which had caused filling defects on the spinogram and presented a clinical history suggesting ruptured intervertebral disc.

The authors believed that primary spinal fusion was indicated only when structural defects in the vertebrae are obvious. All ligaments, laminas, and articular facets exposed should be critically examined during the operation with this orthopedic aspect in mind. Indications for fusion are those suggested by Ghormley, Love, and Young: spondylolithesis, spondylolysis, extensive lumbosacral arthritis or backache of the static type, congenital anomalies such as abnormal sacralization of the lowest lumbar vertebrae, and abnormalities of the neural arch or of the vertebral body, with apparent instability of the vertebra at the time of operation. The history is significant in that only those patients who are relieved by rest and have pain on activity are suitable candidates for fusion. In this series 1 primary fusion and 2 secondary fusions, for later herniations, were done.

The relatively high rate of good results is attributed to the care with which the operative patients were selected. Only those with filling defects and failure to respond to orthopedic care were submitted to operation C. FREDERICK KITTLE, M.D.

SYMPATHETIC NERVES

Tyson, M. D., and Gaynor, J. S.: Interruption of the Sympathetic Nervous System in Relation to Trauma. *Surgery*, 1946, 19: 167.

Interruption of the sympathetic nervous system applies chiefly in 3 general categories, in all of which it

is used to improve the circulation at the site of the trauma. These groups are as follows:

(1) Post-traumatic painful and vasospastic states, with or without Sudeck's osteoporosis. This group includes those cases in which reconstructive surgery is contemplated in the face of a dangerously reduced circulation.

(2) Injury of the main arterial supply of an extremity.

(3) Acute trauma, particularly fractures and crushing injuries to the hands and feet.

Cases demonstrating all of these groups are discussed.

The authors conclude that cases of these types should first have a novocain block to see whether any improvement results. If there is marked improvement which disappears after the effects of the novocain wears off, and the condition is sufficiently serious, permanent interruption of the sympathectomy fibers is indicated. It is believed that this may result in marked reduction of the disability, pain, and period of hospitalization. JOHN W. EPTON, M.D.

Peet, M. M., and Isberg, E. M.: Surgery for Hypertension. *J. Am. M. Ass.*, 1946, 130: 467.

Between the dates of November, 1933, and September, 1945, more than 1,500 patients received surgical treatment for hypertension at the University Hospital at Ann Arbor, Michigan. The operations consisted of bilateral supradiaphragmatic splanchnicectomy and lower dorsal sympathetic ganglionectomy. Of these patients, 437 with essential hypertension were followed up for from 5 to 12 years after surgery, and 57.5 per cent are living from 5 to 11 years after surgery. Eighty-two per cent of the patients had serious organic disease prior to the operation, but 95 per cent of the hypertensive patients who showed no signs of cardiac, cerebral, or renal involvement before the operation are living from 5 to 11 years after surgery. A third of all patients who manifested preoperative disease of the heart, brain, or kidneys did not survive the 5 to 11 year period.

It is pointed out that a complete clinical profile of the patient must be obtained before surgery is undertaken, since it is never an easy task to determine just what patient will benefit by surgery or survive long enough to make the procedure worth while. This profile consisted of studies for renal function and cardiac efficiency, fundoscopic examination, frequent blood pressure recordings, and detailed physical examinations and careful history taking. Favorable changes in the drop in blood pressure with resultant improvement in the subjective complaints of the patients, significant improvement in kidney function, and protection against repeated cerebral vascular accidents in those patients who had had such complications, have been found to be the result of surgery in a gratifying number of patients. For these reasons the authors believe that the life span of the hypertensive patient may be significantly lengthened by surgical treatment, although it is admitted that the "hypertensive predisposition" always persists following surgical treatment, regardless of the fall of the blood pressure to normal levels, and that no claim should be made that essential hypertension is cured by splanchnicectomy. JOHN MARTIN, M. D.

MISCELLANEOUS

Houston, H. E.: The Neurosurgical Service in an Evacuation Hospital. *Bull. U.S. Army Med. Dept.*, 1946, 5: 328.

This is a report on the neurosurgical cases seen in an Army evacuation hospital. Of 1,393 cases cared for on the neurosurgical service, 406 were considered closed head injuries. Approximately 80 per cent were the result of blast and in the remainder the head of the patient had struck or had been struck by some object. No differentiation was made in the two types of injury as it was believed that the less severe blast cases behaved much like concussions from direct force. The more severe ones resembled basillar skull fractures. The chief difference seemed to be the associated ear and lung damage in the blast variety. There were 14 deaths in this group. All of the patients had been admitted while profoundly unconscious, with no localizing signs. No therapy seemed of value in these serious cases and they deteriorated. Autopsy in 2 cases revealed multiple petechial hemorrhages in one and ventricular hemorrhage in the other. Two patients were explored for suspected subdural hematoma with negative results.

Scalp lacerations were treated by conservative débridement and closure of the galea and skin layers with interrupted silk.

Simple fractures were treated as the closed head injuries, but the compound fractures were débrided and closed. Penicillin and sulfadiazine were administered for 4 days or longer. With compound depressed fractures, the depressed area was approached through a burr hole in the normal skull, the entire involved area excised, and the dura closed with silk if opened.

Of 271 patients with penetrating brain injuries, 69 died without surgery. The treatment of shock was given priority over operative care in this group. Less than 50 per cent required shock treatment of some sort and only 10 per cent required intensive shock treatment. Barbiturates and morphine were used to control restlessness and no untoward effects were noted from the use of morphine. The optimum time for surgery appeared to be between 18 and 24 hours following the injury. The single exception to such delay in surgery was in the case of ventricular wounds: these cases deteriorated rapidly if not subjected to surgery. Penicillin and sulfadiazine were employed, and preoperative medication consisted of 3 gr. of sodium amytal, ¼ gr. of morphine, and 1/150 gr. of atropine. The anesthetic agents included pentothal sodium, intratracheal gas-oxygen-ether, and novocain. In at least 85 per cent of the cases pentothal sodium was used. The primary wound was dé-

brided and extended in a linear manner, and the bone around the wound removed to secure a normal dural margin of ¼ inch. Necrotic brain and hematomas were removed with suction. Bone fragments and foreign bodies were removed under direct vision when practicable. Finger exploration was carried out if space permitted, and, finally, the tract was irrigated, a catheter being used if the ventricles were involved. If possible the dura was closed with interrupted silk; if not, the defect was closed with a detached pericranial or galeal graft. The galea and skin were closed with interrupted silk sutures, penicillin and sulfanilamide powder being placed in all of the wounds. If the scalp defect could not be closed, aflap extending down to the periosteum was mobilized and advanced to close the bone defect completely. Wounds involving the paranasal sinuses were treated similarly, except that exenteration of the sinuses was carried out. Dural closure or graft and skin closure seemed particularly important in this group. The head dressing of choice was an unpadded plaster cast.

The prognosis in the cases with ventricular damage was very poor; 12 of the 18 deaths among 201 cases operated on were in this group. The postoperative care consisted of the continuation of penicillin, sulfonamides, and crystalloids, and plasma and blood as indicated. Diet and activity were allowed as tolerated. Patients were evacuated as soon as they were oriented, taking food well, and relatively afebrile. The average postoperative stay was from 4 to 6 days.

Of 85 patients admitted with injuries of the spinal cord or cauda equina, 37 were admitted with associated wounds of the chest or abdomen. The latter injuries were given priority in the treatment. Nine laminectomies were done because of nontransportability to a neurosurgical center. Twelve cases presented complete transection of the cord above the level of the third dorsal segment. Immediately on admission, these patients were given indwelling catheters, x-rayed, and transferred to a well padded litter. If evacuable, they were given highest priority to a neurosurgical center. The prone position was favored in lower lumbar and dorsal injuries, and the recumbent position in upper dorsal and cervical injuries. Casts were employed only for those with an unstable vertebral column. Patients having laminectomies were premedicated with sodium amytal, morphine, and atropine. The operation was as limited as possible. The metallic and bony fragments were removed, the dura closed with silk or with a fascial graft. Complete closure of the soft tissues was carried out. Evacuation was carried out in from 4 to 6 days.

JOHN W. EPTON, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Campbell, O. J.: The Bleeding Nipple. *Surgery*, 1946, 19: 40.

The significance of a discharge from the nipple, particularly a bloody discharge, has been variously interpreted. Some workers have found about the same proportion of benign and malignant lesions responsible for this symptom.

Undoubtedly the difficulty in distinguishing between actively proliferating adenocystic disease and cancer has complicated the problem of determining the true incidence of malignancy in patients with a bloody discharge. Sanguineous discharge from the nipple is not a common symptom.

It has been shown that duct papilloma, carcinoma, and cystic disease are responsible for most of the cases of bloody discharge from the nipple. Other etiological factors, however, are inflammatory lesions, traumatic lesions, hormonal dysfunction, sarcoma, and Paget's disease.

The character of the discharge is merely suggestive, but all types of discharge (with the exception of galactorrhea) need investigation.

Diagnosis is essentially a problem for the pathologist. Frozen sections are not to be relied upon. Because cancers associated with bleeding from the nipple are usually of low malignancy and also because the differentiation between cancer and adenocystic disease may be difficult, the surgeon should permit the pathologist time to prepare and study permanent slides.

In the absence of palpable tumor there are three diagnostic aids for the localization of the source of bleeding: (1) transillumination, (2) mammography, and (3) pressure tests.

Suggested treatment procedures consider the following:

A. Discharge and palpable tumor. The presence of the tumor alone is sufficient justification for its removal. Local excision may suffice for solitary intraductal papillomas and well localized adenocystic disease, but because the sources of bleeding may be multiple it is better practice to excise the entire duct and tributary glands Only when the pathologist has satisfied himself that the lesion is malignant is radical amputation justifed.

B. Discharge and diffuse nodularity. A segmental resection of the duct containing the bloody discharge and its tributary system is done. If cancer is not found and the source of bleeding is eliminated the attitude toward the remaining breast will depend upon the surgeon's attitude toward cystic disease as a potentially precancerous lesion.

C. Discharge and no palpable tumor or demonstrable breast change. Whenever the source of bleeding can be located the offending duct and tributary glands are excised. When the discharge is intermittent or scanty it may be difficult to locate the segment of breast or the duct from which the discharge is coming. Under these circumstances it seems entirely reasonable to keep the patient under observation. Repeated examinations will usually permit localization. The justification for this policy is based upon the extreme rarity of sanguineous discharge from the nipple caused by cancer and without palpable tumor.

D. Bloody discharge from multiple sources. A waiting policy is here indicated unless palpation reveals changes in breast consistency which then justify biopsy of the most suspicious area. Bleeding of such nature may subside spontaneously.

E. Pseudosanguineous discharge. A dark green, sometimes grumose discharge from the nipple may easily be mistaken for bloody discharge. When a single duct is the source, excision is warranted for the patient's peace of mind. The excised duct will show ectasis only. There will be little or no sign of epithelial activity. The dilatation may involve even the smaller tributary ducts in the periphery of the breast. When multiple ducts are involved and no masses except the ducts themselves are palpable, the condition need not be disturbed since sacrifice of the whole breast is unnecessary.

F. Persistent or nonlocalized bleeding. Persistent bleeding from multiple sources or bleeding which cannot be localized may warrant simple amputation. Especially is this true in older women in whom the loss of the breast is not a tragedy, or when the patient herself may elect to end her state of uncertainty or apprehension. STEPHEN A. ZIEMAN. M.D.

Costello, C. J.: Breast Cancer and "Paget's Disease of the Breast." *Arch. Surg.*, 1945, 51: 262.

This study, which has been prompted by the evidence of confusion and the divergence of opinion among clinicians and pathologists alike as to the nature of so-called Paget's disease of the breast, embraces a thorough review of 29 cases as well as a review of the studies and observations by other investigators of this malady. The origin of the dissension emanates from confusion in regard to the cause and significance of, and consequently the therapy indicated for, Paget's disease.

What has been called "Paget's disease of the breast" begins as an intractable eczema of the nipple or areola. The patient's first recollection of the onset is an often recurring pruritis of the skin in this region. Again, the first symptom may be a simple crust associated with weeping or even bleeding of a minor character when it is removed. In some instances the first bleeding is noted to come from the summit of the nipple, although this may not correspond with the center of the cutaneous lesion.

Certain resemblances exist between Bowen's and Paget's diseases. Generally, Bowen's disease is con-

sidered to be a primary epithelial malignant growth of low grade and slow progression. The chief distinguishing feature is that in Paget's disease there is actual dissociation of the abnormal cell, whereas in Bowen's disease the cell continuity with the adjacent epidermal cells is retained and the intercellular bridges in the rete malpighii are preserved.

Paget cells appear to be metastatic cancer cells. The origin of Paget cells may be from breast carcinoma, epithelioma, rectal adenocarcinoma, apocrine sweat gland carcinoma, or other tumors.

In order to insure earlier recognition, refractory eczematoid lesions of the breast should be subjected to biopsy. The mode of extension may be by direct extension, retrograde lymphatic continuity, or ductal spread.

In order to reduce confusion among pathologists and clinicians and in order to facilitate earlier and more rational therapy, the eponymic nomenclature, "Paget's disease of the breast" and "extramammary Paget's disease," should be abandoned; "secondary epidermal carcinoma" is suggested as preferable.

Treatment of secondary epidermal carcinoma must proceed along the lines of rational elimination of the primary carcinoma as well as of the cutaneous lesion. In order to insure a higher curability rate, treatment for secondary epidermal carcinoma of the breast must include radical mastectomy, whether the primary site can be detected by palpation or not.

JOHN E. KIRKPATRICK, M.D.

Oberhelman, H. A.: Diagnosis and Treatment of Carcinoma of the Female Breast. *Surg., Clin. N. America*, 1946, 26: 116.

Pain is not a diagnostic sign of carcinoma of the breast. In one series of 1,040 cases, only 1.6 per cent of the patients came to their doctor because of pain. In only 3 per cent of 500 cases of carcinoma of the breast were there more than one nodule. The author believes that so called borderline or precancerous lesions, which occur almost exclusively in the proliferative and hyperplastic form of fibrocystic disease, call for radical surgery. It should be remembered that carcinoma can develop in accessory breasts; 2 per cent of all mammary carcinomas develop in women under 30 years of age.

The author follows the operative technique of Adair, by which the pectoralis fascia is removed but the pectoral muscles are preserved. Postoperative radiation therapy is used. Local recurrence is treated by local excision of the tumor mass followed by vigorous irradiation. Sometimes in these cases irradiation alone is used. EARL O. LATIMER, M.D.

White, W. C.: The Problem of Local Recurrence after Radical Mastectomy for Carcinoma. *Surgery*, 1946, 19: 149.

The author reports 22.6 per cent of local recurrences among 238 cases of carcinoma of the breast. The patients were observed for a minimum of 5 years. This rate of recurrence compares favorably with statistics from other clinics.

The percentage of local recurrence in cases with axillary involvement was tripled over that in cases with cancer limited to the breast.

The rate of local recurrence was essentially the same if a wide excision of the skin was done and the defect covered with a skin graft, or if a plastic closure was done by removing a circular diameter of about 5 inches of skin (Handley technique) and effecting a plastic closure of the defect by means of dissection of the subcutaneous tissue of the remaining skin.

In the author's experience postoperative irradiation did not reduce the incidence of local recurrence.

EARL O. LATIMER, M.D.

TRACHEA, LUNGS, AND PLEURA

Johnson, J.: Battle Wounds of the Thoracic Cavity. *Ann. Surg.*, 1946, 123: 321.

This article presents the experiences encountered in North Burma from December, 1943 to March, 1945. Three hundred and eight patients were treated in the General Hospital for wounds of the thoracic cavity; of these, 6 were due to bayoneting, 153 to bullets, and 149 to fragmentation missiles. The patients were predominantly Chinese. At least 60 per cent of them were received within 36 hours after wounding, although some were received after 3 or more weeks.

The initial treatment was carried out in portable surgical hospitals under primitive circumstances. The management was conservative in the main, essentially débridement and closure of the chest wall with only an occasional intrapleural procedure. The work of the forward units was highly commended. Evacuation was largely by air.

The patients requiring emergency treatment on arrival at the base were those with (1) blood loss and shock, (2) disturbance of the mechanism of respiration, or (3) combinations of these.

There were 140 hemothoraces or hemopneumothoraces; 103 were treated by thoracentesis. The small number left untreated required a long hospital stay or developed thoracic disability. If infection occurred in these cases, the empyema was larger than if aspiration had been done. Air replacement is condemned. Recurrence of the pulmonary bleeding did not occur as a result of thoracentesis. Fever was frequently present, but persisted only in the infected cases. Infection in the underlying lung may account for this phenomenon. Clotting, or the loculation of pleural fluid from other cause, occurred in 8 per cent (11 patients). Eight of these 11 patients were infected. Only 1 patient was subjected to decortication, and from experiences gained earlier in the campaign, this is the recommended treatment.

Tension pneumothorax was treated by repeated thoracenteses or catheter decompression if the rapidity of the reaccumulation of air justified this. After 4 or 5 days, negative pressure may be added to the water-seal to promote pulmonary expansion. There were 50 patients who had sufficient shift of the

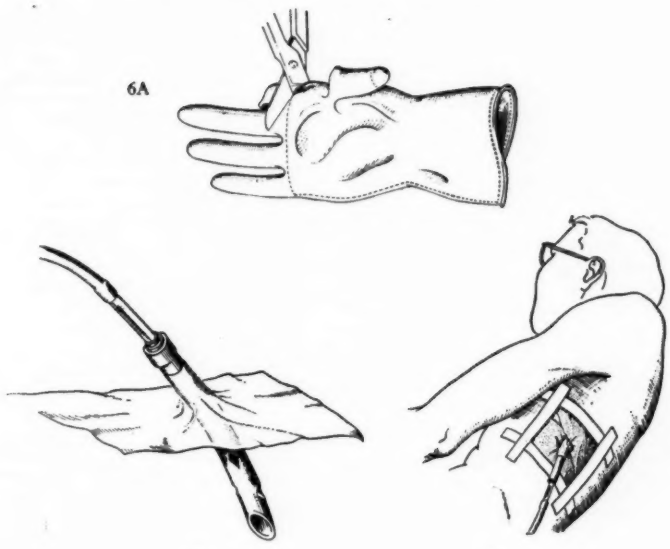


Fig. 1. Method of applying suction to an open thoracostomy. A. The fingers but not the thumb are cut from a rubber glove. The tip of the thumb is cut away. The glove is then cut along the ulnar aspect. This will then open to form a sheet of rubber tissue with the thumb in the center. B. A large rubber tube is then put through the thumb and glued to it. The tube is connected with an ordinary three bottle Wangensteen suction apparatus. C. The skin around the empyema opening is painted with the glue used with the Padgett dermatome for removing skin grafts. A little gauze packing is placed around the tube to absorb any excessive fluid until the rubber tissue is stuck. The rubber tissue is then held moderately taut and placed down smoothly on the skin surface. The tube must already be connected to the suction apparatus so that suction can be applied immediately. This will pull the rubber tissue tightly against the skin surface so that it may become effectively glued. The edges of the rubber tissue are covered with adhesive. When carefully applied this air tight seal is effective for from 10 to 14 days. With the Wangensteen suction apparatus a negative pressure of up to 150 cm. of water can be attained. (Courtesy of J. B. Lippincott Co.)

mediastinal structures to be diagnosed upon clinical examination.

Subcutaneous emphysema was seen in 29 patients. In only 2 was it massive. Relief of a tension pneumothorax corrected this in 1 patient. The other, having a wound of the trachea, low in the neck, required tracheotomy to prevent expulsion of air into the tissues on coughing. This management for certain types of tracheal wounds is discussed and recommended.

Lung wounds were treated conservatively. In only 2 instances did lung abscess develop and both of the patients died as a result of multiple abscesses. Rather rapid clearing of the lung hematoma was a common experience.

The fundamental objective in the treatment of empyema is to obtain adequate drainage and achieve re-expansion of the lung as rapidly as possible. Earlier in the campaign, aspiration over a period of time sufficient to allow for fixation of the lung to the chest wall was undertaken to prevent a total pneumothorax when rib resection drainage was done. This, however, as well as intercostal drainage, was interfered with by difficulty in accommodating the heavy exudate to the lumina provided. Later, therefore, drainage was undertaken much earlier when, under intratracheal anesthesia, a large sized opening was made in the chest by removing the segments of two ribs and intervening muscle. All the exudate was then removed and closed drainage with suction to 150 cm. of water (achieved by a Wangensteen apparatus) was applied, according to the method illustrated. Suction was continued until the cavity was reduced to very small size (5 c.c. or less).

The incidence of empyema was 9.7 per cent, or 30 cases. Five per cent of the bullet wounds, 10 per cent of the shell fragment wounds, and 66 per cent of the bayonet wounds developed empyema. The absence of any case of infection by the hemolytic streptococcus was thought to attest to the value of the use of sulfonamides. Organisms of the salmonella group were found in 3 cases. Four types of empyema are discussed:

1. Infection in a simple hemothorax—16 patients presented this type. They were managed by the principles outlined previously.

2. Infection in a clotted hemothorax (8 patients). These patients were managed in similar fashion, although the earlier the operation was performed the better the outcome. One case came to decortication. One patient with a cavity of 1,200 c.c. capacity, had suction applied 6 weeks after the original injury. In 17 days the cavity measured 50 c.c.

3. Putrid empyema, in 3 patients. These patients differed from those of Type I chiefly in the virulence of their infection. They were subjected to emergency operation and treated by airtight seal and suction.

4. Infected open sucking wounds, in 3 patients. In addition to the infection, these patients had disturbances in respiration. They were treated either by sealing the wound and providing drainage or by drainage through the wound, all of which was sealed.

There were no deaths among the 30 patients with empyema. Complete re-expansion of the lung was obtained in all but 2 patients. These had been treated conservatively, until recrudescence of fever brought about the demonstration of infection, presumably rupturing from the underlying lung into the hemothorax. The cavities were greatly reduced and both were closed by a Schede procedure.

There were 61 patients with retained missiles (7 bullets and 54 shell fragments). These did not seem important in the production of empyema. In no instance was it definitely demonstrated that the foreign body produced a typical putrid lung abscess, spontaneous drainage into the pleura was believed to have been seen, however. Only 1 patient had a massive pulmonary hemorrhage. Foreign bodies larger than from 1 to 1.5 cm. in size were generally removed; 23 of the 61 foreign bodies were removed. Two foreign bodies were associated with a putrid empyema in which operation was done as an emergency; 1 foreign body was removed from the pericardial sac because of effusion with tamponade and cardiac failure, 1 from the free pleural space because of persistent effusion, and 1 from the mediastinum, close to a large vessel, and 18 foreign bodies were removed from the lung more or less electively. The patients were allowed to recover as completely as possible from not only the lung wound but any pleural complication before removal was undertaken. The details of the operative approach are given. In 1 case a pure culture of clostridium welchii was obtained from the cavity around the foreign body, but no complications occurred. No significant complications were encountered, and all of the patients returned to duty.

There were 4 patients who had recognizable wounds of the heart or pericardium. One had a perforation of his left ventricle, left lung and spleen. Although his wounds were repaired, he died. Another had a slow tamponade due to shell fragment lodged in the posterior pericardial sac. Two cases of pericarditis were seen following wounds. These 3 patients were successfully treated.

There were 46 thoracoabdominal wounds. The mortality in this group was 20 per cent, or 9 patients. Only 1 patient died as a result of a chest wound.

The total number of deaths in this series of 308 patients, regardless of the associated injuries or diseases, and regardless of the cause of death, was 23, a mortality of 7.4 per cent. Twelve of these patients had insignificant chest wounds. Only 6 patients, 2 per cent of the total series, died primarily of their chest wounds. The cause of death in these 6 was (1) a sucking wound that had persisted for 48 hours without treatment (the patient died 3 hours after being seen); (2) perforating wound of the heart, lung, and spleen; (3) cerebral air embolism (2 cases, 1 proved by autopsy); and (4) multiple lung abscesses (2 cases).

Numerous illustrative roentgenograms, as well as a photograph, are appended.

HIRAM T. LANGSTON, M.D.

Klosk, E., Bernstein, A., and Parsonnet, A. E.: Cystic Disease of the Lung. *Ann. Int. M.*, 1946, 24: 217.

Cystic disease of the lung is found in the course of routine physical and roentgen examinations since it rarely gives symptoms. The authors review the literature and report a series of 13 cases at the Beth Israel Hospital, Newark, New Jersey, discussing specifically the complications of this disease.

Cystic disease of the lung is defined as any condition in which the lung parenchyma is replaced by sharply defined cavities containing fluid or air. Dermoid cysts of the lung, echinococcus cysts, and encapsulated interlobar accumulations of fluid or air are excluded. Cystic disease may be congenital or acquired, or both, with the prevalent opinion leaning toward the congenital origin.

Clinically and pathologically, congenital cystic disease falls into two groups: (1) the large solitary cyst usually found in infancy and early childhood which displaces the heart and mediastinum and gives symptoms of cyanosis and dyspnea, and physical signs of tension pneumothorax; and (2) degeneration of the lung parenchyma by multiple miliary cysts or large multilocular or unilocular cysts. Acquired pneumatocele or pneumocyst is usually associated with respiratory infection, chronic bronchitis or peribronchitis, pulmonary fibrosis, and emphysema or bronchial asthma.

The solitary cysts are lined by a layer of columnar and cuboidal epithelium resting on a tunica propria and a layer of connective tissue. The cavities in cystic degeneration are similarly lined but the epithelium may be thrown into folds by intraluminary proliferation with an adenomatous appearance. Clusters of thin walled cavities communicating freely with the bronchi are lined with columnar ciliated or nonciliated epithelium. The contiguous alveolar walls in the presence of pneumatocoles or pneumocysts from bullous emphysema are encrusted with coal pigment.

Roentgenographically, an acquired pneumatocele may be indistinguishable from the congenital form, although one suspects the acquired form when the lesion is seen in an adult.

Roentgenographically, solitary cysts appear as large areas of radiolucency which may or may not contain fluid. They may be so ballooned out with highly positive intraluminary pressure as to resemble tension pneumothorax.

The second form of cystic disease is characterized by the honeycombed appearance of the pulmonic fields with thin walled, sharply defined annular shadows without accompanying interstitial parenchymal infiltration. Direct communication with the bronchus can be confirmed by bronchography on the finding of cystic spaces in grapelike clusters.

Complications of the disease are common and some of them bring the patient to the doctor. Upper respiratory infections are very often followed by infection in the cystic areas with episodes of pneumonia, without, however, the severe constitutional symptoms associated with acquired bronchiectasis, nor the cerebral manifestations associated with pulmonary suppuration. Cardiorespiratory reserve diminishes with age with increasing dyspnea and sometimes death from failure of the right side of the heart. The most frequent complication is hemorrhage, seldom profuse, but varying from slight hemoptysis to exsanguinating proportions: its true source has not been established.

The case reports describing the complications are given in the following order of frequency: (1) fluid filled cystic disease (1 case), (2) cystic disease complicated by hemorrhage (4 cases), (3) cases complicated by infection (2 cases), (4) cases complicated by spontaneous pneumothorax and hemopneumothorax (2 cases), and (5) acquired cystic disease (3 cases).

LYNN JOHNSEN, M.D.

Fatti, L., and Others: Acutely Infected Pleural Effusions; Techniques of Penicillin Treatment. *Lancet*, Lond., 1946, 1: 295.

The authors used various techniques in administering penicillin in the treatment of 24 acutely infected pleural effusions—in 14 while the pneumonic symptoms were still present and in 10 after this phase subsided. The success or failure of these techniques was determined by comparing the results with a series of 14 controls treated along well accepted lines. The duration of illness both from the earliest pneumonic symptoms and from drainage until full healing of the controls was 15 and 11.5 weeks, respectively. Any penicillin treated case taking as long as this full healing was considered a failure. Treatment was successful only when the duration was less than the shortest time taken by any of the controls—8.5 weeks from the earliest pneumonic symptom and 5 weeks from drainage.

Seven cases were treated by aspiration followed by the injection of penicillin. The organisms were the pneumococcus in 2 cases, the staphylococcus in 2, and the streptococcus in 3 cases. The results were success in 2 cases, partial success in 1 case, and failure in 4 cases. The successes occurred in cases with interlobar collections of not more than 2 ounces. One death occurred in this group. The failures occurred in cases of extensive empyema in which the original thin fluid thickened so that aspiration was almost impossible. Three of these cases were treated later by rib resection. This method was abandoned early in the series except for small interlobar effusions which could be completely emptied by aspiration.

Three cases were treated by rib resection, all of which were considered failures as they healed in about the same time as the controls. Two cases were due to the hemolytic streptococcus and 1 was due to the anaerobic streptococcus. All 3 cases became secondarily infected with the staphylococcus aureus. This method of treatment was abandoned when it was realized how badly these cases were progressing compared with the others treated by the methods subsequently described.

Ten cases were treated by intercostal drainage and the instillation of penicillin with success in 7, partial success in 3, and failure in 1 case. There were 7 pneumococcal, 2 staphylococcal, and 1 anaerobic streptococcal cases. The intercostal tube was alternately used for drainage and the instillation of penicillin. The only failure resulted from faulty technique in draining a multiloculated empyema from one loculus only. Rib resection was eventually carried out. All these cases healed in from 6 to 7.5 weeks from the first symptoms and from 2 to 4.5 weeks from drainage. This method was most suitable for localized empyema, as the risk of lung collapse was slight and the emptying of the cavity was far more effective than aspiration once the exudate thickened.

Eight cases were treated by aspirations and injections, with subsequent intercostal drainage. There were 6 pneumococcal infections, 1 staphylococcal infection, and 1 pneumococcal infection, but no hemolytic streptococcal cases. Aspirations and injections were carried out for a preliminary period followed by an intercostal drain when the exudate thickened. These cases healed in from 5 to 8.5 weeks from the first symptoms and from 2 to 4.5 weeks from drainage. It was believed that the time of aspiration was unnecessarily prolonged in most cases. This is the method of choice for all effusions treated in the toxemic phase because the lung expands readily and obliterates the cavity, and the fluid does not loculate.

In the treated series it was found that the intrapleural administration of penicillin not only influenced the local condition, but also provided a systemic concentration for periods of from 24 to 48 hours. The dose should be from 120,000 to 240,000 units for an adult and 1,000 units per pound of body weight per 24 hours for children under 5 years. Sterile cultures from pneumococcal and streptococcal effusions are by no means a reliable guide to the elimination of infection and time to stop treatment. Smears negative for gram-positive cocci are much more reliable. X-ray evidence save for fluid levels was not a safe criterion on which to rely for the discontinuance of drainage. Following surgical drainage, the risk of secondary infection was great and this prolonged suppuration and healing.

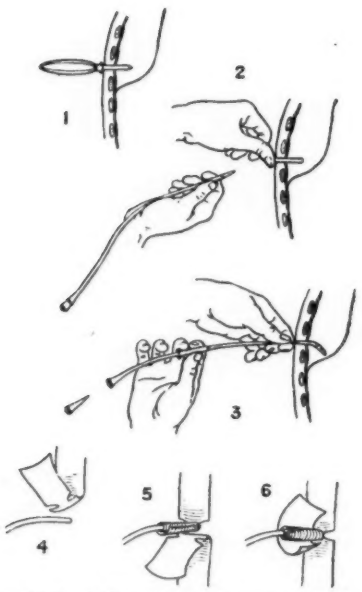


Fig. 1. Method of setting up intercostal drainage; (1) trocar and cannula inserted into the pleural cavity through a small incision through the skin and subcutaneous tissues; (2) mouth of cannula blocked with thumb till well fitting drainage tube is inserted while spigoted; (3) removal of cannula while air is prevented from entering pleural cavity by firmly gripping tube close to chest wall; (4) "elastoplast" cut to fit round and attach tube to chest wall; (5) second strip cut similarly; (6) third strip to hold the other 2 firm on tube. Tubes attached in this way have remained *in situ* 10 days in patients who were not restless.

Thin effusions in the toxemic phase should be treated by aspiration of as much fluid as possible, the last 10 c.c. being saved for bacteriologic examination. Penicillin, 240,000 units (2,000 units per pound of body weight in children under 5 years) in 20 c.c. of saline solution, should be injected slowly into the cavity and the patient must be watched for coughing up yellow stained sputum as this usually indicates a bronchopleural fistula. If the cultures are positive, the treatment is repeated every 2 days until the effusion is frankly purulent. Then an intercostal drain is inserted at the suitable spot—a trocar and cannula with a drainage tube which exactly fits the bore of the cannula (Fig. 1.) are used. The cavity is left to drain overnight under a water seal if the toxemic stage is passed. If not, an instillation of penicillin is given as soon as all the pus seems to be removed. Instillations are given twice a day in the tube with care to prevent the ingress of air. Up to 20 c. c. containing 500 units of penicillin per cubic centimeter are instilled, for pneumococcal or streptococcal infections if the toxemic phase is passed; 600,000 units are injected twice daily for staphylococcal infections. Drainage is set up twice a day, an hour before each instillation, by connection with the under water system.

A roentgenogram is taken the day following the insertion of the drain to check on its position and to determine residual effusion. The film is taken after drainage and before instillation of the penicillin. Drainage and instillation are discontinued when the pus disappears and the discharge is serous or slightly turbid and watery. If 3 serial bacteriologic examinations made on separate days are negative for smear and cultures, the drainage tube is removed and a final instillation is made as it is withdrawn. A dry dressing is fixed in place over the sinus and is not disturbed for from 5 to 7 days, by which time the wound should be dry. If it remains wet it should be examined bacteriologically for secondary invaders of the sinus tract. Breathing exercises are instituted the day after drainage is started to aid in drainage and expansion of the lung. Washouts should be avoided unless the tube is clogged by fibrin. If necessary, washing should be done under aseptic precautions in the operating room.

If these procedures are followed, the period of aspiration and injection lasts about a week, drainage from 10 to 14 days, and full healing of the sinus another 7 to 10 days, a total treatment of from 4 to 6 weeks.

Purulent effusions are best drained immediately, before the fluid becomes too thick to pass readily down the intercostal tube.

Small cavities bounded by the interlobar space walls may be treated by aspiration and injection alone. Aspirations are carried out every other day and 240,000 units are injected. Indications for discontinuing treatment have been described.

The consensus of opinion is that aspiration and injection with penicillin, with or without intermuscular injections, may clear up empyema, but the pleural thickening and resultant diminished respiratory reserve following long persistence in this treatment cannot be overcome except by standard methods of surgical treatment. The authors demonstrate a technique which combines the use of an antibacterial agent and drainage, and causes minimal discomfort to the patient.

Although the standard for successful results was high, 18 of the 20 cases treated as recommended came up to it. The earlier the effusion was detected and penicillin started, the shorter the duration of the illness. There is good reason to believe that the duration of treatment will be even shorter when these cases are treated at the earliest possible moment that fluid is detected and referred early to the surgeon. Chronic empyema present a year or more will probably not respond to the treatment outlined here.

Aspiration was preferred to drainage because continuous retention of the drug was assured and contact of the drug with the whole infected area was secured. The patients, however, preferred the drainage, and the change-over was made as early as possible and in accord with good treatment.

Nine of the 24 patients had bronchopleural fistulas and in spite of this the treatment was effective. Injections given more frequently than once every 48 hours might be recommended, as the patients cough up a fair proportion of the drug.

When infections were not located, penicillin injected into the pleural space had a well marked effect on the toxic signs but failed to prevent the formation of pus.

The continual danger of superadded infection by gram-positive organisms, once the drainage had been set up, compelled the authors to continue with penicillin until no further interference with the wound was necessary. Rib resection offers a freer portal of entry to invading bacteria and prolongs healing. Superadded infection with gram-negative organisms is more of a nuisance than of serious consequence. It can be avoided by careful dressing.

The x-ray findings were a source of considerable concern to the clinician. In some cases drainage was prolonged, fruitless explorations performed after drainage had been discontinued, and rib resection and thoracoplasty were considered on the strength of residual shadows. Screening is an essential factor in the treatment of empyema to distinguish fluid from pleural shadows and to aid in placing the tube correctly. ROBERT R. BIGELOW, M.D.

HEART AND PERICARDIUM

Levin, M. M.: The Clinical Picture and Therapy of Heart Injuries. *Vrachebnoe Delo*, 1945, p. 141.

In the majority of cases there is no clear cut picture of an injury of the heart. Especially during the first few hours of the trauma, signs considered typical for this type of injury, such as acute anemia and tamponade of the heart, are usually absent. In doubtful cases watchful waiting is indicated. The best approach is through the original wound which can be dilated by enlarging the port of entry and resecting portions of one or several ribs if necessary. Whenever possible the heart should be sutured *in situ*. The pericardium and pleura should be closed without drainage.

Early evacuation of the blood from the pleural cavity is important in the prophylactic treatment of infection as such blood may lead to a purulent pleurisy.

The remote results of suture of the heart may be quite satisfactory.

Subjective symptoms of an injury of the heart, such as anxiety, pain in the cardiac region, a sensation of oppression, weakness, dizziness, dyspnea, and fainting are present in not more than 50 per cent of the cases, and are of clinical importance only if combined with signs of progressing internal hemorrhage, acute anemia, compression of the heart, and a suggestive location of the external wound. Severe external hemorrhage is relatively rare because usually the blood first fills the pleural cavity.

The author prefers the approach through the original wound to methods employing musculocutaneous or musculo-osseous flaps. In 1 case he was obliged to ligate the peripheral branch of the descending portion of the coronary artery. The operation was not followed by any immediate or remote untoward results. JOSEPH K. NARAT, M.D.

Finch, E.: Discussion on Surgery of the Patent Ductus Arteriosus. *Proc. R. Soc. M.*, Lond., 1946, 39: 107.

The chief danger in ligation of the patent ductus arteriosus is infection causing a subacute endocarditis which is fatal; but it is to be remembered that the patients with this condition, apart from being in danger from infection, must live the restricted life associated with a cardiac lesion. The diagnosis of the condition is not always an easy one. There are, however, some cardinal points in the uncomplicated case which may be mentioned. The patients usually are known to have had a cardiac lesion from childhood. They are usually small in size and they may complain of shortness of breath, but usually as they have had the lesion all their life, they are not conscious of this disability. On examination they have no finger clubbing and usually no cyanosis. Palpation over the pericardium may or may not reveal a turbulent heart action and a thrill over the upper part of the left chest, its maximum about the second interspace. Auscultation reveals the characteristic murmur suggesting a heavy machine shop and which is known as the "machinery murmur"; its essential feature is its continuous quality.

An x-ray film of the chest usually reveals certain characteristic features. The pulmonary artery is enlarged so that a bulge can be seen below the aortic knuckle, and there is usually some enlargement of the heart. The vascular shadows in the lungs are very obvious and in some cases markedly so.

Hunter believes that the mechanical defect, together with the risk to life, is sufficient to warrant surgical intervention in the uncomplicated case, except in that of the very young; in these cases operation should be postponed to a later date. A search for septic foci is made. Usually because of the cardiac condition patients have not had their tonsils and adenoids removed, but, when necessary, this is now a routine, the operation being performed under prophylactic doses of the sulfonamides. Breathing exercises are instituted as soon as the patients come into the hospital and are continued throughout their stay.

The operative technique employed by Hunter is the same in all cases and the approach used was that originally described by Gross. Although the approach is a limited one, it allows the reconstitution of the chest wall more completely and permits the re-expansion of the lung more easily than the usual thoracotomy incision. It does not allow, however, the same access in dealing with complications of the operation.

The ductus itself when defined is very short and runs an unexpected anteroposterior course. It can be elongated by gentle traction with a finger on the

pulmonary artery while the ligatures are being passed. Two No. 8 silk ligatures are used as ties, care being taken not to damage the recurrent nerve with the ligatures.

The wall of the ductus itself varies in thickness. In the majority of cases it is very thin, and in 2 instances the author observed the blood moving in the vessel. In both of these the impression was given that the flow was from the pulmonary artery to the aorta. This is against all the views previously expressed, but these views have been largely theoretical. It has always been assumed that the flow was from the aorta to the pulmonary artery on the grounds that the pressure in the aorta was more than in the pulmonary artery and also that the enlargement of the heart suggested an extra load on the pulmonary side. This is further strengthened by the increased pulmonary vessel shadows as seen on x-ray examinations. It has been estimated that the flow through the ductus is very large, up to 50 per cent or more of the left ventricular output. It is remarkable that this extra work does not result in more serious signs of myocardial insufficiency, and when the increase in blood pressure and the great increase in the size of the heart that occurs when an arteriovenous fistula of similar size is caused by injury is considered, one must ask if there is not some factor present in the congenital case that has not yet been explained.

Surgeons are not satisfied with ligation in continuity, and there is no doubt that the next forward step in this region is to divide the ductus completely.

The difficulties encountered during the operation are: the problems in connection with exposure, local bleeding of a slight character but sufficient to obscure the field and make the procedure tedious, puncture of the pericardial extension along the ductus with a small constant stream of pericardial fluid, the presence of glands in the arch of the aorta which are sometimes difficult to clear from the ductus, and, the most serious, the tearing of the ductus either while it is being defined or due to the ligature material cutting through it.

The complications after operation are fluid or air, or both, in the pleural cavity. In no case has there been cause for anxiety during convalescence, and by expanding the lung with positive pressure to reduce the air in the cavity there should be no danger. In an uncomplicated case there should be no blood in the pleural cavity.

The usual convalescence is quiet in children; they are well after 24 hours, and it is probably only conservatism that confines them to bed for a week or 10 days. The follow up shows that both the adults and children are more robust and in better general health than before. It would be fair to say that they were unaware until after the ligation of the ductus what limitations had been imposed on them because of their disability. In time the ultimate fate of these patients will be known. At this time it can only be said that by ligation of the ductus we have reduced their chances of getting a bacterial endocarditis.

In discussing this article TUBBS thought that Hunter's novel suggestion that the blood flow in a patent ductus during postnatal life was from the pulmonary artery into the aorta could not be maintained, although it provided a ready explanation for the surprising cure when infection was present. There appeared to be ample evidence in support of the classic view that the blood flow was from the aorta into the pulmonary artery: (1) in uncomplicated cases there was no cyanosis which could be present if venous blood were sucked into the aorta from the pulmonary artery; (2) the low diastolic pressure usually associated with patency of the ductus was readily explained by the classic view but very difficult to understand if the blood flow were in the reverse direction (the diastolic pressure was regarded as inversely proportionate to the calibre of the ductus); (3) pulmonary congestion due to the overloading of the pulmonary circulation from the aorta was often found several years before other signs of heart failure developed; (4) dilatation of the pulmonary artery sometimes with actual aneurysm formation (an x-ray film depicting such an aneurysm was shown) was commonly present because of the raised pressure caused by the flow from the aorta; (5) the oxygen content of blood removed from the pulmonary artery at operation had been shown to be abnormally high; (6) pulmonary infarction always preceded systemic embolism when subacute endarteritis had complicated the picture: and (7) there was the irrefutable evidence of cardioangiography, revealing that none of the relatively concentrated dye in the pulmonary artery entered the aorta.

The indications for surgical closure of the ductus required careful consideration. Infection was undoubtedly an absolute and urgent indication for operation as the prognosis in unoperated cases had been almost universally fatal in the past. Symptoms or signs of cardiac failure were regarded as indications for operation. In addition, enlargement of the heart or a diastolic pressure below 60 was thought to foreshadow failure at a later date and was therefore grounds for surgical treatment. Retarded development in childhood was likewise an indication.

Preparation for operation in the uncomplicated case was not thought necessary. If infection was present a sulfonamide was given for 5 days before operation in order to reduce the fever. If it failed to do so, penicillin was given for a similar period and with the same object. An intravenous drip was started before operation in case of severe accidental hemorrhage, but was discontinued as soon as the operation was completed as the burden on the heart would be augmented by the infusion of fluids in the absence of blood loss.

In isolation of the ductus, it is important to recognize a fingerlike process of serous pericardium which often overlaps the anterior part of the pulmonary end of the ductus. This process should not be opened but should be stripped off the ductus toward the heart by blunt dissection. If it is opened, the constant leak of pericardial fluid will obscure the field.

Patience and gentleness are the passwords to success in the rest of the process of isolation.

The means whereby permanent closure of the ductus might be invariably obtained is the most outstanding problem. In view of the reports of successful cases which were treated by division between clamps, this should be considered in many, if not all, cases. STEPHEN A. ZIEMAN, M.D.

Sellors, T. H.: Constrictive Pericarditis. *Brit. J. Surg.*, 1946, 33: 215.

Surgical intervention in disorders of the human heart is still regarded as something in the nature of a dramatic adventure, although in recent years it has been shown that the surgeon's hand is more kindly tolerated than was once thought possible.

Constrictive pericarditis which ties down the heart movement and produces chronic compression can be relieved only by some direct form of excision of the cicatrized pericardium.

The essence of constrictive pericarditis lies in the fact that contraction of pathologically formed intrapericardial adhesions restricts the normal action of the heart. It is well known that adhesions can exist without obvious interference with function: on the other hand, extrapericardial adhesions dragging on a diseased heart may add to its enlargement.

Starting then with a constricting and limiting layer of dense fibrosis in the pericardial tissues it is possible to see how increasing contraction brings about progressive impairment of cardiac function. The heart is practically strangled to death by cicatrization of its own movement.

The chief effect of the fibrosis is to limit diastole. The oncoming venous blood cannot be accepted in full amount by the restricted relaxation, and the pump, being insufficiently supplied, has less to deliver in its forcing stroke.

On the arterial side of the circulation, the limitation of the diastolic supply and consequent reduction of the systolic output is recognized by a low level systolic blood pressure (from 90 to 110 mm. Hg) and a low pulse pressure (from 15 to 25 mm. Hg not being unusual). In normal circumstances the response to exercise results in an increased output of the heart beat associated with some increase in rate, factors which combine to give a substantial increase in the volume output per minute. In constrictive pericarditis the output per beat is limited and the only way in which the necessary volume per minute can be sustained is by an undue increase in the pulse rate. Tachycardia is therefore a comparatively early sign and this becomes even more prominent on exertion. Dyspnea similarly occurs on exercise, but is absent at rest, and does not occur when the patient is lying flat (an important sign in the differential diagnosis). The presence of a paradoxical pulse is common.

Edema occurs in the dependent parts of the body, particularly in the legs, where in course of time the edema takes on a lymphatic appearance. Facial and arm edema may be present although they are not always noticeable, but swelling of the face has been seen to develop in the course of days when rapid constriction was occurring. Cyanosis of varying degree is common and the extremities are blue, cold, and uncomfortable. These symptoms are out of proportion to the degree of dyspnea, being more dependent on the raised venous pressure than on the unduly reduced cardiac output.

Liver enlargement with ascites is one of the cardinal signs of constrictive pericarditis: both are proportionally much greater than in a comparable case of congestive heart failure. Apart from other significant signs the enlarged belly is almost bound to attract attention.

A remarkable feature in all this interference with the circulatory system is that the lungs are unaffected.

Such symptoms as lassitude, wasting, and weakness are regularly encountered and can be understood in the light of the general interference with the circulation.

To complete the classic triad of the compression syndrome, according to Beck, a small quiet heart should be added. This, however, requires qualification, since a reduction in the apparent size is by no means always seen, but the presence of a 'quiet' or practically immobile heart can be emphasized.

One of the fundamental points of constrictive pericarditis is that the heart muscle is normal in nearly every case. The myocardium is not diseased and it is potentially sound, although its activity has been sorely restricted in the process of constriction. If the restraining pericardium is removed, in the course of time the myocardium will be able to function with a power that approaches normal. Moreover, the condition only embarrasses the patient's existence when the local mechanical state has jeopardized the circulation as a whole.

Whereas the heart muscle itself is relatively normal, the same cannot be said about cardiac rhythm. The presence of contracting scar tissue and even plaques of calcium around the "pacemaking" area may account for irregular stimulation. All types of irregularity are encountered and periodic changes of rhythm are not uncommon. Operative handling of the heart produces extrasystoles and sometimes fibrillation, although these disturbances, even if they are more than transitory, generally subside within 24 hours. Any pre-existing irregularity is not necessarily replaced by normal rhythm after surgical removal of the pericardium, although this has occurred on occasions.

Electrocardiography shows remarkably uniform results, the principal features being a low voltage type of curve and lowering or inversion of the T-wave. The loss or inversion of the T-wave is commonly seen in Leads I and II and contrasts with pericardial effusions, which exaggerate the RS-T and the T-wave. After pericardiectomy there is some improvement in the voltage and a tendency for the T-wave to become less flat or inverted, but this is not marked for some time after effective liberation of the heart.

The current literature submits three possible causes for the origin of constriction—tuberculous infection, old pyogenic pericarditis, and idiopathic factors. The last accounts for the largest group in the published records, but it is easy to understand that the limited tissue available for microscopic examination from pericardial excision, and the duration of the disease fail to afford complete facilities for investigation.

The future of a patient with constrictive pericarditis depends on the rate of development of the condition. The slowly developing case which is not submitted to careful and systematic investigation may pass through many hands before the disease is finally diagnosed. These patients can live for years in limited and tolerable health.

Removal of the restraining pericardium to allow as full a ventricular expansion as possible is the only treatment for established pericardial constriction. Excision of all the pathological pericardial tissues would be the ideal; however, this is not practicable but the improvement following limited removal is remarkable. Excision should aim primarily, and possibly only, at freeing the ventricles, although for anatomic reasons even this is rarely achieved. The usual procedure is to resect the anteriorly placed pericardium and to carry the dissection outward over the apex and around the left border of the heart. The very thinness of the auricles and great veins makes interference over them a hazardous undertaking. Attempts to perform an extensive ventricular clearance without an opening into the left pleural sac often results in a more limited operation than was originally planned. To free the left border of the heart to an adequate extent the dissection should be carried posteriorly beyond the line of the phrenic nerve; but to do this and at the same time preserve the integrity of the pleural cavity is practically impossible. Consequently a deliberate transpleural approach to the heart may be countenanced as readily as the more popular extrapleural exposure.

The incision through the pericardium should be carried through both layers down to the heart muscle and not only through the parietal layer. This must be emphasized because it is quite easy to find a plane of cleavage between the parietal and visceral pericardium even after years of apparent adherence. The dissection plane between the visceral pericardium and myocardium is not as easy to define.

The full aim of dissection is to free the anterior surface of the right ventricle and the front part of its diaphragmatic aspect, and to free the left border of the heart from over the apex well on to the diaphragm and complete the excision laterally behind the level of the left phrenic nerve. The obliquely placed auriculoventricular groove marks the upper limit, and although clearance beyond this area is frequently advocated, it can be seen from a section of this region that there is little margin for error.

The tolerance of the heart muscle to handling is considerable. The ventricles respond to manipulation by repeated extrasystoles and are liable to fibrillate if touched too often and too much; consequently periods of rest should be a routine part of the operation. During these intervals small warm packs or muscle grafts can be applied to bleeding areas on the freed heart muscle. The possibility of cardiac arrest is present, but with the heart practically under manual control this need not be too alarming; 5 c.c. of 1 per cent procaine injected intravenously is said to be of value in controlling an unduly turbulent heart. STEPHEN A. ZIEMAN, M.D.

ESOPHAGUS AND MEDIASTINUM

Patterson, C. O., and Rouse, M. O.: Esophageal Varices. *J. Am. M. Ass.*, 1946, 130: 384.

Esophageal varices on direct inspection through the esophagoscope are so large in some instances that they softly occlude the esophagus.

Patients have complained that substernal and upper abdominal distress precedes hematemesis, and it is possible for the patient and the patient's family to predict the approaching catastrophe of hemorrhage. It appears, therefore, that persistent substernal distress occurring in a patient having known or suspected esophageal varices would indicate the need for x-ray study and probably esophagoscopy as well as the injection of any veins large enough to produce symptoms.

The authors have noted that patients in a critical state of shock immediately before the injection, appeared in no danger at all a few moments after the injection, and were sitting upright in bed sipping milk 10 hours later. It would thus appear safe to give the injection treatment after the patient is in the proper hospital environment with reasonable assurance as to the diagnosis and with adequate facilities, particularly typed whole blood, available. The contraindications to esophagoscopy should, of course, always be kept in mind.

In the instance of another patient, the preparation for necessary splenectomy was repeatedly disrupted by massive hematemesis. Only after the injection of the sclerosing solution into the esophageal varices did the hematemesis cease and the red blood cell count maintain a safe level for surgery.

Hemorrhage occurs not infrequently from esophageal varices. This fact, as Kegaries showed, is best explained by the anatomy of the gastric veins, which tend to be subserosal and are held more firmly by the less elastic structure of the stomach. On the other hand, in the esophagus the varicose veins tend to be submucosal and are held less firmly by the areolar tissues of the esophagus; therefore they have a tendency toward sacculation and protrusion into the lumen of the esophagus, where they are more vulnerable to ulceration and rupture.

The ultimate evaluation of the treatment of esophageal varices by the injection of sclerosing solutions will take some little time and careful observation.

Five per cent sodium morrhuate solution was used for the injections. JOHN J. MALONEY, M.D.

Montaño, G.: Clinical and Roentgenological Aspects of the Differential Diagnosis of Mediastinal Tumors (Consideraciones clínicas y radiológicas en relación con el diagnóstico diferencial de los tumores del mediastino). *Gac. méd. México*, 1945, 75: 277.

Since mediastinal pathology and especially that of mediastinal tumor is a very difficult one from the diagnostic standpoint, a study of it based on 80 cases seen in the Cancer Section of the General Hospital of Mexico City is presented.

The anatomy of the mediastinum and of its contained structures is reviewed. The author divides the mediastinum into an anterior and a posterior portion by a vertical plane passing through the pulmonary hilum, and into an inferior, middle, and superior section.

Symptoms produced by mediastinal tumors are essentially due to pressure or encroachment on, or displacement of, the adjacent organs by the process. These lesions may reach huge proportions without symptoms or may, by their relation to juxtaposed organs, produce definite localizing signs. Three general classes of symptoms are to be recognized: (1) respiratory or digestive symptoms, (2) symptoms due to the involvement of the nervous system, and (3) symptoms due to the involvement of the vascular tree. The first group of symptoms is very much as expected. The second group is also of understandable manifestations, although localization by the segments of the peripheral nerves involved may be helpful, or the discovery of a Horner's syndrome or recurrent laryngeal nerve palsy is quite diagnostic. In the third group, it will be remembered that the establishment of collateral circulation may indicate, for example, whether the superior vena cava is involved above or at the confluence of the azygos vein. The collateral channels are thoracic if the involvement is above the juncture, and abdominal as well as thoracic if both vessels are involved.

Of the 80 cases studied, 60 were manifestations of lymphoblastoma. The symptoms in order of frequency were dyspnea, supraclavicular or cervical thickening or tumefaction, pain, cough, edema, cyanosis, a collateral venous circulation, and hemorrhage.

The malignant mediastinal tumors, in general, do not produce the extensive compression or displacement syndromes that benign neoplasms do because they tend to invade rather than compress or displace, and their course is rapid, not allowing time for the development of a compensatory mechanism.

The roentgenological approach to the study of the mediastinum is also difficult because of the superimposition of the shadows produced by the several organs contained within it. Demonstration of abnormality depends on the encroachment of the process onto the space occupied by the lung field.

The first question to settle is whether the abnormal x-ray shadow is primarily in the lung or in the mediastinum. This can be inferred by observing the angle of incidence of the shadow with the mediastinal border (according to Lenk). Oblique projections of the thorax will be useful in determining whether the mediastinal lesion is anterior or posterior.

Malignancy is suggested by irregular borders of the shadow, which indicate invasiveness. The degree of displacement or compression of the adjacent organs is important, in that benign tumors are more apt to present this feature in greater degree than infiltrative malignant ones. A symmetrical tumor suggests a single origin in contradistinction to a lobulated one; the latter suggests a multicentric character such as occurs in tumors of the lymphatic group.

Finally, irradiation can serve as a basis for classification of these tumors by the type of response produced. Great radiosensitivity indicates tumors of the lymphoblastoma group. Within this group certain variations permit distinctions, for example, between Hodgkin's disease and the more radiosensitive types. Moderate response is seen in carcinomas of the thymus or thyroid, fibrosarcoma, and metastatic carcinoma. No response suggests a histologically benign neoplasm, or aortic aneurysm.

The location of the tumor offers some differential help: it is in the anterior mediastinum, one should suspect cysts, teratomas, intrathoracic goiters, tumors of the thymus, or aortic aneurysms; but if it is in the posterior mediastinum, one should expect tumors of neurogenic origin, vertebral tumors, cold abscesses, lymphatic tumors, or aneurysms of the descending aorta.

Numerous illustrative roentgenograms are appended, without case histories.

HIRAM T. LANGSTON, M.D.

Adams, W. E.: Surgery of the Mediastinum. *Surg. Clin. N. America*, 1946, 26: 130.

During the past three decades, with their advances in the control of surgical pneumothorax, exposure of the mediastinal structures has become possible and treatment of congenital lesions, infections, tumors, cysts, or traumatic lesions has advanced apace. The scope of surgery in this region is now extensive. The details of 3 cases illustrating the more common procedures are given.

The first case was that of a 45 year old, white woman with a dermoid cyst of the mediastinum. She came under observation because of an intrathoracic mass discovered by a routine employment roentgenography as the condition was virtually asymptomatic. Her general condition was excellent, positive findings being confined to the chest. The roentgenogram revealed a huge rounded mass some 14 cm. in diameter in the right lower anterior lung field. Normal diaphragmatic motion was present and no expansile pulsation could be made out fluoroscopically. No calcification could be seen in the mass.

Thoracotomy was performed through a right anterolateral incision. The pleura was entered through the sixth interspace and additional exposure

was secured by dividing the fourth, fifth, and sixth cartilages and extending the incision in this line. The mass was easily removed after incision of the mediastinal pleura. The lung expanded freely. The thorax was closed with drainage. The postoperative course was uneventful and the patient was discharged at 2½ weeks. She was asymptomatic 11 months after the operation. The specimen was a cystic mass containing yellow fluid, cheesy material, and hair. The wall, microscopically, revealed stratified squamous epithelium, hair follicles, and sebaceous glands.

Mediastinal dermoids are usually located anteriorly and produce symptoms largely because of their size. They may undergo malignant change and for this reason their removal is indicated.

The second case was that of an 18 year old white male with a neurogenic tumor of the mediastinum. He presented a mass in the upper right chest adjacent to the mediastinum. It measured from 2 to 2½ inches and was relatively asymptomatic. It was found on a routine chest roentgenogram. The mass did not pulsate on fluoroscopic examination. No other abnormality was discovered. Under general anesthesia the right pleural cavity was entered through the bed of the sixth rib. This tumor presumably arose from an intercostal nerve and was found lying along the vertebrae opposite the third, fourth, and fifth ribs. After removal, the raw area was covered by pleura and the chest closed in layers, catheter drainage being provided. The postoperative course was uneventful and the patient was asymptomatic when seen 6 months later. The mass weighed 58 gm. and was considered a neurofibroma after histological study.

The mediastinal tumors of nervous tissue origin are usually located posteriorly. They are frequently asymptomatic, but they undergo malignant change and may produce symptoms by pressure on the adjacent structures. They are to be differentiated from cysts, intrathoracic goiter, and aneurysm.

The third case was that of a 55 year old white male with carcinoma of the esophagus, who complained of difficulty in swallowing for 9 or 10 months. This was first noted with solid food, later with liquids also, and during the last 2 or 3 months a tendency to regurgitate food was noted. Pain in the epigastrium, particularly when he was trying to swallow solid food, had been noted for this period also. He had lost 35 pounds in weight and a great deal of strength. He was markedly dehydrated and emaciated. A pronounced esophageal obstruction at the junction of the middle and lower thirds of the esophagus was demonstrated by barium study.

After 10 days of preparation, operation was undertaken. The left pleural cavity was entered through the bed of the eighth rib and the incision extended upward after resection of short segments of the fifth, sixth, and seventh ribs posteriorly and ligation of the corresponding intercostal vessels. The lesion extended from just below the aortic arch downward for some 4 inches. The mediastinal pleura was incised and the esophagus mobilized. The right pleural cavity was not opened. The diaphragm was then opened and the stomach mobilized. The left gastric artery was ligated, but the gastroepiploic artery along the greater curvature was preserved. The spleen was removed to facilitate the procedure. The esophagus was transected at its lower end and the cardia closed by a double row of sutures. The esophageal mobilization permitted delivery of the tumor above the aortic arch. The stomach was brought up into the chest and anchored to the parietal pleura. The esophagus was anastomosed to an opening in the fundus of the stomach by a double row of sutures. Careful protection against soiling was taken and rubber shod clamps were used during the procedure. The diaphragm was closed around the stomach. Sulfathiazole crystals were placed about the anastomosis. The chest was closed in layers with drainage.

The procedure was performed without shock and convalescence was uneventful. The patient was allowed to drink small amounts of water on the fifth day, and by the twelfth day had progressed to 6 soft feedings a day and fluids as desired. He was discharged in 3 weeks and was still well after 8 months. The tumor was a squamous cell carcinoma confined to the esophagus. The diagnosis was made by barium study and esophagoscopy.

Great progress has been made in the surgical management of these lesions. Operation offers the only chance for survival in these patients and the risk is not formidable.

Sketches, roentgenograms, and photographs of the specimen accompany the discussion.

HIRAM T. LANGSTON, M.D.

MISCELLANEOUS

Svet, N. M.: The Pathogenesis, Clinical Picture, and Therapy of Chest Injuries. *Vrachebnoe Delo*, 1945, p. 135.

The author reports on 2,500 cases of chest injuries; 45.2 per cent of these wounds had a port of entry and exit, while 45.8 per cent were blind. Among the early complications, shock was observed in 0.6 per cent, acute hemorrhage in 2.3 per cent, and anaerobic infection in 0.5 per cent. Among late complications the following are mentioned: empyema in 16.8 per cent, pleurosepsis in 2 per cent, infiltration of the lungs in 10.7 per cent, pulmonary abscess in 5.6 per cent, gangrene of the lungs in 0.3 per cent, pneumonia in 6.3 per cent, exacerbation of tuberculosis in 0.5 per cent, and toxic psychosis in 0.5 per cent.

In 54.3 per cent of the patients with hemorrhages the latter disappeared nearly completely, leaving in a small number of cases adherences which yielded to diathermy, iodoiontophoresis, and other methods of physiotherapy. In 18.8 per cent hemothorax and hemopneumothorax became transformed into a pyothorax, which in 2 per cent had an acute course in the form of pleurosepsis. Sixty-five per cent of the infiltrations were absorbed while in 35 per cent of the

cases an abscess developed. Of the secondary lobar pneumonias, 60 per cent were located at the site of the injury and 40 per cent on the opposite side. Contrary to the common pulmonary abscess which produces a characteristic roentgenogram, the traumatic abscess of the lungs may not show air above the fluid level. The latter spreads in concentric direction while the common abscess of the lung spreads in an eccentric direction.

The empyema complicating a hemothorax is usually unilocular while that complicating a hemopneumothorax is multilocular.

The following therapeutic measures were used by the author: (1) active therapy of the hemorrhages; (2) Bulau's drainage, instituted early and continued for a short time; (3) stimulation of the absorption of infiltrations and abscesses; (4) general stimulation of the organism in the form of blood transfusions, intravenous administration of glucose, employment of cardiac stimulants, vitamin C, and good nourishment; and (5) early employment of physiotherapy in order to prevent pneumonia and diminish anoxemia.

Aspiration of the hemothorax was usually started on the day following the injury. A rib resection was performed only for empyema of long duration or any other virulent process. As a rule, the drain was introduced in the ninth intercostal space in the posterior axillary line. A drain was never introduced into the port of entry of the missile.

In cases with empyema the pleural cavity was irrigated with potassium permanganate, hydrogen peroxide, chloramine, streptocide, rivanol, or alcoholic solution. Patients with abscesses or infiltrations of the lungs were given, in addition to other therapeutic measures, intravenous injections of sodium benzoate, rivanol, saline solution, calcium chloride, sodium salicylates, or novarsenol. The best results were obtained from intravenous injections of from 10 to 15 c.c. of a 10 to 15 per cent sodium benzoate solution given daily over a period of 10 days.

Iodoform in the form of an emulsion proved efficient in the treatment of gangrene of the lung.

Repeated blood transfusions up to 10 were given to patients with complications.

Patients with an open pyothorax were treated with Bulau's drainage and occlusive dressings after a preliminary introduction of Vishnevski's ointment into the pleural cavity.

In open hemothorax the gravity of the condition soon after the injury is attributable not to mediastinal flutter but to pleuropulmonal shock. Therefore, the advisability of transforming an open pneumothorax into a closed one is sometimes open to discussion.

Graded breathing exercises were instituted in all patients with penetrating chest injuries; they were started on the day following the trauma, in order to prevent pneumonia and anoxemia. The exercises were not employed in the presence of repeated hemorrhages, shock, or anaerobic infection. In patients with multiple rib fractures paravertebral block with novocain was employed to diminish pain which would interfere with the breathing exercises.

Thirty-five patients, or 14 per cent, died. The mortality in empyema was 2.4 per cent, in lung abscess 2.1 per cent, in traumatic pneumonia 2.5 per cent, in pleurosepsis 24 per cent, in acute hemorrhage 28.5 per cent, in gas infection 16.5 per cent, and in shock 6.6 per cent.

Forty-seven and two-tenths per cent of all the patients with chest injuries recovered within 30 days after the injury, 23.9 per cent within 50 days, and 29.9 per cent within 60 days.

Foreign bodies in blind injuries usually became encapsulated.

If a chest injury is combined with a transdiaphragmatic trauma of the abdomen, either a typical or a transdiaphragmatic laparotomy is indicated.

JOSEPH K. NARAT, M.D.

Samson, P. C., Burford, T. H., Brewer, L. A., III, and Burbank, B.: The Management of War Wounds of the Chest in a Base Center. *J. Thorac. Surg.*, 1946, 15: 1.

This article encompasses the experiences of the first fully established center for thoracic surgery in the north African theater of operations receiving its patients from the Sicilian Campaign. The principles of treatment delineated are the outgrowth of an overall experience with some 1,500 major thoracic injuries. The trends of therapy are illustrated by reports of representative problem cases amply supported by roentgenograms and sketches.

Blood was found in the pleura in virtually all intrathoracic injuries. Treatment was by means of thoracentesis without air replacement, beginning after 3 or 4 days (during which time cessation of the pulmonary bleeding or leakage of air was expected, by virtue of the partial compression), unless the symptoms demanded earlier aspiration. Air replacement was believed to defeat the purpose of obliterating the pleural space by pulmonary re-expansion. Fever was frequently present, but generally subsided in a few days in the absence of infection.

The intrapleural blood frequently clotted; it may do this within a few hours. If the hemothorax was not reducible by thoracentesis, catheter suction also failed to provide significant improvement.

Clotting of the hemothorax is frequently followed by organization, although the factors responsible for this are not clear. Within a week fibroblastic and angioblastic proliferation may be seen extending from the pleura into the overlying fibrin coat. In 4 weeks, adult fibrous tissue can be recognized in the older layers, and in 6 or 7 weeks, the organized layer may be 1 cm. thick. The parietal portion is invariably thicker than the visceral. This is erroneously called "thickened pleura." The lung is encased in this cicatricial envelope, being thereby compressed and immobilized. Infection does not alter the process of organization, that element being manifested by leucocytic infiltration in the unorganized zone of the fibrin clot primarily.

The first application of the principle of decortication in this theater was by one of the authors (T. H. B.), in May, 1943. This operation is indicated when at least 50 per cent compression of the lung is present, especially if the apex is collapsed; and in those in whom aspiration has been unsuccessful and in whom there has been no appreciable pulmonary expansion at the end of 4 to 6 weeks following injury.

The optimum time for such intervention is between 3 and 5 weeks following injury. "The important technical considerations are: (1) meticulous establishment of the proper cleavage plane between peel and visceral pleura; (2) careful blunt dissection of the peel either digitally or by gauze dissector; (3) complete freeing of the lung where it is directly adherent to the thoracic wall, to the mediastinum, or along the fissural margins, so that circumferential expansion can be obtained; (4) decortication and mobilization of the elevated fixed diaphragm, with particular attention to redeveloping the costophrenic sulcus; (5) deliberate intermittent expansion of the lung under increasing positive pressure, with careful stroking of atelectatic areas." After decortication, a grossly normal, thin, translucent expansile pleura is found. Bleeding is only moderate and easily controlled by pulmonary expansion. Decortication of the parietal "peel" is not considered necessary.

Proof of infection in these cases was based on finding organisms in the bloody fluid aspirated from patients showing clinical signs of toxicity. There was frequently a delay in obtaining bacteriologic confirmation. Anaerobic streptococci and staphylococci were frequent offenders.

Small empyemas have been treated by the usual methods of aspiration and drainage, but larger ones (with 25% or more pulmonary compression) have been managed by evacuation of all clot and decortication of the parietal peel. This has been done under the protection of systemic and local administration of the sulfonamides or penicillin. The mechanism of production of post-traumatic empyema varies, since contamination may enter through the chest wall, from the lung by way of a bronchopleural fistula, or by spillage from an abdominal source when the diaphragm is involved. The latter type may occur as a result of contamination in a pleural space relatively free from blood and do well under the usual methods of drainage. Nearly every post-traumatic empyema, however, develops in a hemothorax (hemothoracic empyema) and the infection is contained within the walls of the intrapleural hematoma instead of being confined by the pleurae themselves. In these cases total empyemas are more frequent, and pulmonary expansion is more often problematical, as compared to postpneumonic empyemas, and periosteal reaction and clubbing of the fingers are not seen. Adequate drainage is necessary and can be promptly carried out without awaiting "thick pus," since the fear of mediastinal mobility is not great in view of the pathogenesis of the condition. Water seals are not mandatory after drainage. If pulmonary expansion does not occur in from 4 to 6 weeks, decortication has given gratifying results. Decortication without preliminary drainage in patients in good condition is feasible and recommended.

Multiple empyema, particularly in the presence of bronchopleural fistulas, in an otherwise expanded lung, is best managed by accurately placed multiple rib resections, as indicated.

Because of the cloth and debris in the wound, foreign bodies (metallic from 1.5 cm. up in size) should probably be removed, preferably between the fourth and tenth days after injury. This allows the lung to recover from its original trauma and be readily expansile, yet not lay down dense pleural adhesions or heavy fibrosis around the missile. Most of the pericardial and myocardial foreign bodies should probably be removed. However, removal of retained fragments that are asymptomatic is a problem *sub judice*.

Continued intrapleural bleeding generally comes from some vessel in the chest wall. Severe hemorrhage has rarely been seen from a lung wound.

The 15 detailed case abstracts illustrate the diagnostic approaches, principles of management, operative details, and immediate end results. Thirty-two illustrative roentgenograms and 4 sketches are included. HIRAM T. LANGSTON, M.D.

Keynes, G.: The Surgery of the Thymus Gland. *Brit. J. Surg.*, 1946, 33: 201.

Up to a recent date there has been almost complete absence of surgical interest in the thymus gland. In support of this statement the author points out that there has never before been a contribution on this subject in the *British Journal of Surgery*.

Surgery of the thymus principally includes operations for the relief of thymic asthma, tumors, and myasthenia gravis. Thymic asthma is sometimes seen in young children in whom there is a recurrent difficulty in breathing associated with stridor and cyanosis. Death sometimes ensues. The asthma has been supposed to be due to the pressure in the thorax of an abnormally large thymus, and attempts have therefore been made to relieve the supposed obstruction to respiration by removing the thymus. It was claimed that in four-fifths of the operated children the attacks of suffocation ceased, and stridor was less.

Surgical therapy, however, was shortlived and medical opinion has fluctuated as to whether the thymus gland is really the cause of thymic asthma. It is no longer generally believed that the thymus is the cause of death in the so-called "status lymphaticus." But apart from this there was another good reason why surgery for this condition has faded out and has not been heard of for many years. An enlarged thymus gland consisting largely of lymphoid cells can be made to disappear rapidly under x-ray irradiation.

Thymic tumors are common. Lymphosarcoma, perithelioma, Hodgkin's disease, spindlecelled sarcoma, and epithelioma have been described, but

their removal has seldom been attempted, and most of those that have been removed were in patients who had myasthenia gravis associated with the growth.

It seems that of the five kinds of thymic tumor the epithelial tumor is the only one that is ever found coexisting with myasthenia gravis and, furthermore, when the epithelial tumor occurs, the association with myasthenia is almost invariable.

Blalock's recent success with the relief of myasthenia gravis by thymectomy directed attention to this field of surgery, and since 1942 Keynes has performed 51 such operations. The technique employed consists in a T-shaped incision over the sternum and the latter is divided with a Schumacker's sternum splitter as far as the fourth cartilage.

Exposure of the mediastinum permits dissection of both lobes of the gland and their removal. On removal of the retraction the two halves of the sternum spring back into their proper position and the soft tissues over them are securely sutured in two layers with strong catgut. The cancellous bone heals rapidly and care is taken not to limit the maximum excursion of the chest in any way by tight bandaging.

The association of a thymic tumor with myasthenia gravis has an important bearing on the treatment of myasthenia by thymectomy, which is often unsuspected. It seems that at least 1 in 10 of the patients coming to operation is found to have a tumor, and the implications of this fact are of considerable importance. The tumors are thickly encapsulated, but, nevertheless, they show a tendency to burst through the capsule, and histologically they consist of a homogeneous mass of epithelial cells in a state of great activity. Their appearance suggests that the margin between innocence and malignancy is rather fine, and the removal of these tumors at as early a stage as possible is of the greatest importance to the patient's welfare.

All patients with tumors tend to respond more slowly and incompletely than most individuals respond to prostigmine.

Of the 51 patients whom Keynes operated on, 38 are still alive and have been benefited by the operation.

STEPHEN A. ZIEMAN, M.D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Hobbs, W. H., and Cohen, S. E.: Gastroduodenal Invagination Due to a Submucous Lipoma of the Stomach. *Am. J. Surg.*, 1946, 71: 505.

The authors present a complete classification of the forms of intussusception which occur in the alimentary tract. They then present a case report of a gastroenteric type of intussusception seen in 1937.

The patient, a 61 year old white female, was troubled with constipation for 12 years. Three years before admission she began to lose weight and tired easily. In November, 1935 she had a severe paroxysm of pain in the right upper quadrant of the abdomen radiating to the back and right shoulder. It was accompanied by nausea and vomiting. She was treated medically for gall bladder disease and recovered, but had many similar milder episodes. In December, 1937 she was unable to retain food in her stomach, had mild pain, and vomited for 3 days before admission. Bowel movements were normal. For a year previously, she had noted a nontender mass above the umbilicus.

Physical examination revealed dehydration, a soft abdomen, and a freely movable (3 by 5 cm.) mass in the epigastrium in the region of the transverse colon. The admission diagnosis was carcinoma of the transverse colon with metastatic obstruction of the pylorus. Gastrointestinal x-rays revealed that the antrum of the stomach did not fill and there was marked retention (50% after 48 hours). Laboratory examinations showed a moderate anemia. On the fifth day in the hospital the patient developed severe generalized abdominal pain with rigidity and tenderness.

Laparotomy was performed on the ninth day. At least two-thirds of the stomach with the greater part of the omentum had become invaginated into the duodenum (Fig. 2). The latter was dilated up to 3 inches in width. A tumor mass measuring about 4 by 3 inches in diameter was palpable at the duodenojejunal junction. By slight traction on the cardia and a milking manipulation, retrograde disinvagination was effected. The circulation of all bowel was found to be unaffected. After reduction a large intragastric tumor was palpated. The anterior wall of the stomach was opened and a large pedunculated soft tumor was found attached to the posterior wall by a broad short pedicle.

A sleeve resection was carried out because the nature of the tumor was uncertain. A cholecystectomy was done as the gall bladder contained numerous calculi. The patient made an uneventful recovery, regained 20 pounds of weight, and has been

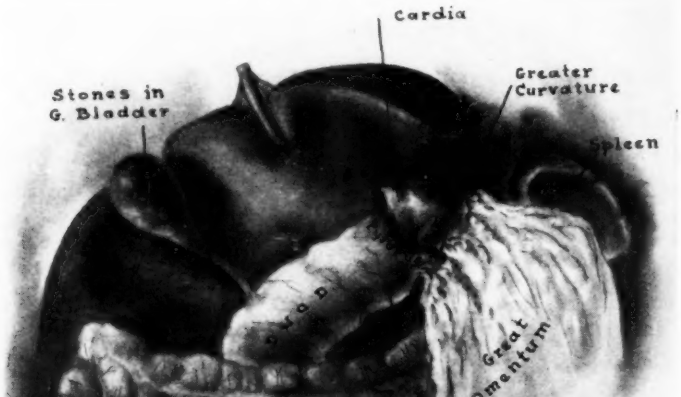


Fig. 1. The anatomic relationships encountered during the laparotomy.

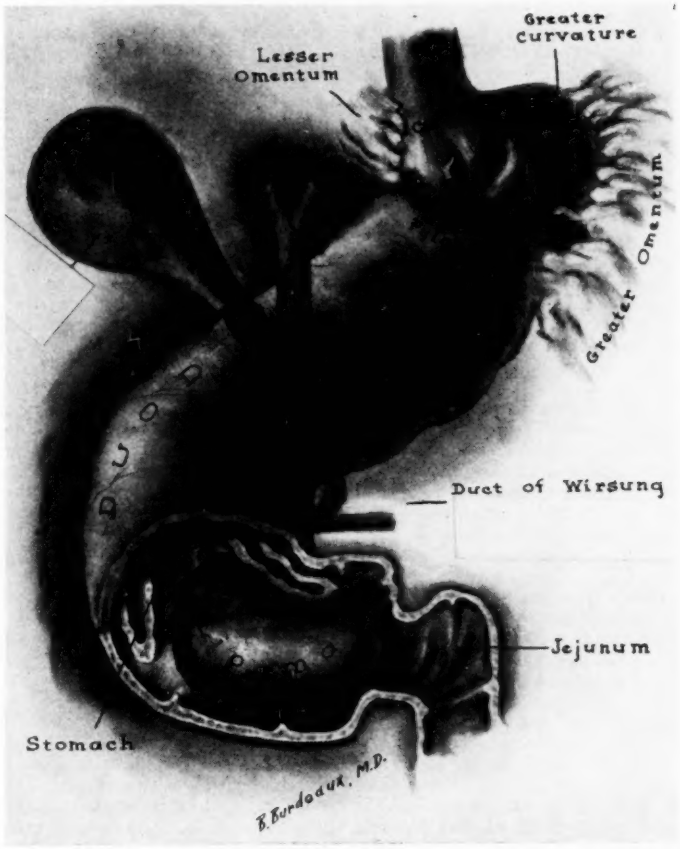


Fig. 2. Closeup of the duodenal segment. (Courtesy of American Journal of Surgery.)

free of gastrointestinal complaints for over 7 years. Microscopically, the tumor was a benign lipoma covered with gastric mucosa showing chronic inflammation and interstitial hemorrhage.

The authors review the reports of benign gastric tumors in the literature. The general estimate that from 0.5 to 5 per cent of all gastric tumors are benign may be too low. It is possible that the figures should be between 15 and 20 per cent. Eliason and Wright in a series of 610 cases of benign gastric tumors found that 4.8 per cent were lipomas. Minnes and Geschickter reported that 3.4 per cent of their 931 cases were lipomas. Benign gastric tumors are relatively infrequent, but adequate numbers have been described. Lipoma is the least frequent of the more important nonepithelial types. The authors' case is the thirty-ninth case reported in 120 years.

The authors then present in tabular form all 41 cases of gastroduodenal invagination assembled from the literature. Women predominated among the patients in the ratio of 25 to 18. The age incidence varied from 12 to 78 years. In practically every case a tumefaction was present in the stomach, predisposing to intussusception.

Gastroduodenal invagination can be classified as partial or complete according to whether only the mucosa or all of the layers are involved. It is central or lateral if the axis of the intussusception is parallel or at an angle to the long axis of the stomach, respectively. The severity of the invagination may be graded from I to IV according to the anatomic division of the duodenum reached by the intussusception. Occasionally, retrograde invagination may occur and the oral segment may come to lie outside of and around the aboral segment. This is to be called

invagination with an external mechanism to distinguish it from the usual intussusception displaying the internal mechanism. These classifications are suggested by the authors after a study and review of the 41 cases presented in the literature.

According to this nomenclature the authors' case presented was complete, central, of grade IV, and with an internal mechanism. Only 2 other cases reported were of this type; 9 were more severe; 7 were of grade II; and 4 were of grade III. The central type is more frequent than the lateral, and the complete more common than the partial.

The symptoms at the onset are those of a benign stomach tumor—pain in the epigastrium or umbilical region, nausea, vomiting, eructations, anorexia, fatigue, diarrhea, loss of weight, and emaciation. Hemorrhage and melena are frequent and at times a tumor is palpable. If the papilla of Vater is occluded, jaundice may occur. In a late stage the picture is one of intestinal obstruction requiring an emergency operation. Grades I and II may lead to a ball-valve syndrome with a sudden obstruction of the pyloric lumen by a relapsed tumor or intussusception. The symptoms are sudden with violent attacks of retching and vomiting accompanied by flatulence and pain. These attacks subside in time, and the patient is comparatively well between attacks.

Roentgenologically, in these cases Moore's criteria for the diagnosis of a benign gastric tumor are in part applicable. In addition, (1) a central area of translucency in the bulb with moderate transitory foreshortening of the antrum with a shift of the pylorus to the left may occur; (2) converging axial striations are caused by tension on the cardial portion of the stomach; and (3) parallel transverse striations perpendicular to the axial striations are due to barium in the lumen of the intussusceptions. Other cases show the "abrupt sign"—abrupt delineation of the media running across the middle of the stomach, with or without spurs.

Natural cures of intestinal polyps following torsion and strangulation of the pedicle have been reported. Surgical excision of the offending tumor by local or sleeve resections is the usual procedure. The latter is preferred when intussusception is present. The prognosis is defined by the degree of prostration, the severity of the bowel damage, and the patient's ability to withstand the operation.

The lesions occur when there is a morbid feature, such as a tumor of the stomach or a mucosal tumefaction. Certain predisposing factors such as mobility of the pyloric or cardiac end of the stomach with relaxed gastrohepatic and gastrocolic ligaments usually are present. The tumor acts as a foreign body within the lumen and excites the gut to expel the tumor. Peristalsis carries it into the succeeding bowel segment, and the tumor pulls the stomach after it.

The mode of development of gastroduodenal invagination with an external mechanism is different. The stomach glides isoperistaltically and surrounds the first portion of the duodenum. Fixation of the aboral bowel segment is an absolute requirement.

Two cases of double invagination involving the stomach are reported. ROBERT R. BIGELOW, M.D.

Delannoy, É., and Verhaeghe, M.: Ulcers Located High Up on the Posterior Surface of the Stomach (Ulcères haut situés de la face postérieure de l'estomac). *Rev. chir.*, Par., 1945, 64: 193.

The diagnosis and treatment of ulcers located near the cardia are always difficult, but especially when such ulcers develop on the posterior surface of the stomach. This type of ulcer is rare as evidenced by the fact that the 4 cases here reported were the only ones encountered in a series of 1,500 gastrectomies. No instances of ulcer involving the tuberosity above the horizontal line passing through the cardia were encountered. This type is also extremely rare, occurring in less than 3 per cent of all gastric ulcers. The incidence of ulcer of the subtuberosity at the junction of the upper and middle third of the vertical portion of the stomach has been variously cited as from 6 to 17 per cent. Such ulcers are often of considerable size and have a tendency to come to a head at the upper margin or tail of the pancreas or to become adherent to the posterior abdominal wall. Spontaneous healing is probably not infrequent.

In gastrectomies for ulcer, heavy bands are frequently encountered, fixing the anterior surface of the pancreas to the posterior surface of the stomach. The pain is not of constant type, but in one case spontaneous subcostal pain or subcostal pain, induced by the method of Mallet-Guy for diagnosis of chronic pancreatitis, could be demonstrated. An earlier x-ray examination had yielded negative results, but a later film taken with this possibility in mind yielded positive results. The pain has also been known to simulate that of phrenic origin or of angina pectoris. The clinical symptoms are vague and of little diagnostic aid.

Roentgenographic examination by ordinary techniques usually yields negative results. The ulcer, even if it has had time to become visible, and is located in the middle of the posterior surface, will not change the appearance of the two curvatures. According to Moutier, these ulcers can be more easily demonstrated gastroscopically. Ledoux-Lebard and Garcia Calderon have recommended a special technique for roentgen visualization of these ulcers. By following the descent of the first swallow of the contrast medium, a small hook of opaque medium may be demonstrated at the site of the ulcer, but this is a transitory phenomenon and might also be caused by a fold of the gastric mucosa. Ascending palpation following the ingestion of the contrast medium may likewise be employed to produce a suspended ulcer image. The best method consists of examination of the patient in dorsal decubitus after ingestion of sufficient contrast medium to fill the tuberosity. The posterior surface, having become inferior in this position, can then be examined as the

air forces back the anterior surface which has become uppermost. A combination of careful clinical, radiological and gastroscopic study will yield the best diagnostic information.

Various surgical methods have been recommended to deal with high posterior gastric ulcer. The technique of Pauchet, which has been found useful for high ulcer of the lesser curvature, will not suffice. In ulcers of the upper third of the posterior surface of the vertical portion of the stomach, a total subcardial gastrectomy may be necessary. In most ulcers of the subtuberosity, subtotal gastrectomy is indicated, although in very small ulcers the section may be made obliquely from above downward, proceeding from the ulcer toward the greater curvature. This approximates Pauchet's "section en gouttiere", and facilitates gastrojejunal anastomosis. Such interventions as transpyloric gastrostomy, wide gastroenterostomy, Madlener's operation, and total gastrectomy should be reserved for special indications. Transpyloric gastrostomy is recommended only for anemic, aged, or debilitated patients. Also Madlener's operation should be attempted only in aged or debilitated patients or in cases of constricted thorax with little prospect of tolerating a longer more difficult intervention. Good results were obtained by gastrectomy in all of the 4 cases treated by the authors. EDITH SCHANCHE MOORE.

Krarup, N. B.: On the Results of the Medical Treatment of Peptic Ulcer. *Acta med. scand.*, 1946, 123: 181.

In an effort to elucidate the results obtained by medical treatment of peptic ulcer, the author studied 665 patients (449 men and 216 women) admitted to Bispebjerg Hospital, Copenhagen, in the period from 1931 to 1938. All had uncomplicated cases of peptic ulcer, which were classified as bleeding (165 cases of hematemesis and 122 of melena) and nonbleeding or painful (81 gastric and 297 duodenal ulcers, all roentgenologically demonstrable) ulcers.

Patients with bleeding ulcers were given a puree diet throughout their hospital stay; those with gastric or duodenal ulcers were started on milk and strained oatmeal and allowed additions until they too were on a puree diet. Both types of patients were kept in bed for 3 weeks. After about 4 weeks they were discharged but advised to continue the dietary regime at home for at least four months. The follow-up study consisted of detailed questionnaires.

The immediate results of treatment were good. Ninety-five per cent of patients with bleeding ulcers were symptom-free at the time of discharge from the hospital. Five per cent of these had a relapse very soon after discharge. Of the patients with painful ulcers, 75 per cent of those with gastric ulcer and 80 per cent of those with duodenal ulcer felt well at the time of discharge. Of these patients, 20 per cent had a relapse almost immediately after leaving the hospital. Final results, after an observation period of at least 5 years, were less encouraging. Of the 626 patients who could be located, 29 per cent had recovered, 36 per cent were improved, and 35 per cent had a poor result. The first two categories include patients who had suffered relapses; the last category includes those who died, i.e., 15 per cent of the total number of patients.

In analyzing the factors related to the disease, the author points out that age and sex seem to have little bearing on the outcome. The duration of the disease had a definite bearing on its outcome. Patients who had had ulcer for less than 6 months had a 50 per cent chance for recovery. This figure decreased to 20 per cent as the duration progressed to 3 years. A previous cure of the disease decreased the patient's chance for recovery. Results of treatment were poorest in patients with duodenal ulcers and best in those with bleeding ulcers. Fifty-eight patients were subjected to operation, 17 of them for perforation. The other 41, most of whom had duodenal ulcers, sought relief from symptoms. Relapses were frequent. The greatest number occurred in patients with gastric ulcers, 86 per cent of which recurred. Only 3 per cent of the group of patients died as a direct result of having an ulcer. Nine died of perforation, 8 of hemorrhage alone, and 2 of pyloric stenosis.

A comparison of the author's material with studies made by Nielsen and Mattisson showed that peptic ulcer has not undergone any essential changes as a disease, although it has undergone considerable change in its manifestations within the past 25 years. From being a disease chiefly involving the corpus ventriculi and encountered especially in women, it has now become a disease seen chiefly in man and most often involving the duodenum. Therapeutic results for the now predominant duodenal ulcer appear to be even poorer than would be expected from previous investigations.

The author's concluding opinion is that since medical treatment has effected such poor results for a steadily increasing number of duodenal ulcers and for recurring gastric ulcers, whereas resection appears to be producing an increasing number of cures, the indications for surgery should be broadened.

B. F. LOUNSBURY, M. D.

Rickles, J. A.: Multiple Carcinomas of the Stomach. *Surgery*, 1946, 19: 229.

The occurrence of multiple benign lesions of the stomach has been reported several times, and, although multiple malignancies of the gastrointestinal tract are second in frequency to skin lesions, multiple malignancies of the stomach are comparatively rare. A case in which 5 primary cancerous lesions of the stomach were present, and which was treated by transthoracic gastrectomy, is presented. The patient was a negro male, 54 years of age. Following preliminary study a diagnosis of carcinoma of the stomach was made. Abdominal exploration was performed and a large carcinoma of the cardia which had extended into the thoracic esophagus was found. The stomach was opened to permit examination and biopsy of a small, soft lesion at the pylorus and was

then closed, following which it was mobilized for a second stage transthoracic removal. Three weeks later a total transthoracic gastrectomy was performed with a good recovery.

Pathological study of the specimen showed ulcerating carcinoma of the cardiac end of the stomach infiltrating the muscularis, with metastases to the perigastric lymph nodes, and four papillary adenocarcinomas of the gastric mucosa apparently arising from adenomatous polypi. These tumors involved the mucosa and submucosa, but not the muscularis. Although much alike microscopically, these tumors were separated by normal mucosa and submucosa. The patient died suddenly several months later after a sudden onset of distention, which may have been due to metastases. JOHN L. LINDQUIST, M.D.

Norgaard, F.: Periodic, Spontaneously Remittent Volvulus and the Symptoms in Cases of Colon Elongatum. *Acta radiol.*, Stockh., 145, 26: 163.

The term volvulus usually calls to mind an acute intestinal obstruction and consequent local circulatory disturbance due to a loop of bowel turning about its mesentery (pathological volvulus). The author reminds us, however, that lesser turnings of intestinal loops have long been known to occur without producing symptoms (physiological volvulus), and he records 4 cases which at roentgen examination of the colon with a barium enema were believed to have low grade asymptomatic volvulus of a redundant sigmoid loop and demonstrated an accompanying long axial torsion of the involved bowel. In such cases the volvulus and the consequent torsion at each end appeared not to exceed 180 degrees, so that no obstruction was offered to the passage of contrast material.

It is pointed out that while a volvulus of 180 degrees does not cause actual obstruction, it may result in a considerable obstipation and pain if the axial torsion be forcibly compressed into a shorter portion of the twisted loop or adjacent segment, as may occur secondary to increased dilatation of the loop. The author has encountered 4 cases in which the patients gave a long history of frequent attacks of sudden abdominal pain associated with obstipation. In 3 of these relief was customarily obtained by change of position (lying down) and followed by a sudden passage of much flatus, and in each a barium enema revealed this type of volvulus without ileus but with localized axial torsion in a redundant sigmoid (3 cases) or a long loop of the transverse colon (1 case). In each instance slight to marked resistance was offered to passage of the barium column at the point of the compressed torsion. Operation was performed in 2 cases, and in each the mesentery of the sigmoid loop was found to be scarred. Resection of the involved loop was done in 1 case, while in the other the loop was derotated and fixed. Following operation both patients had relief of the periodic attacks of pain. The author believes that these 4 cases represent instances of periodic, spontaneously remittent volvulus, which in the fourth and most severe case had ultimately become unable to twist spontaneously because of the marked scarring of the mesentery.

In addition, the author presents 8 other patients complaining of attacks of obstipation, meteorism, and vague abdominal distress, in whom low grade volvulus and axial torsions were found at roentgen examination. In most of these instances there was some obstruction to the passage of the barium column until the bowel became derotated.

LILIAN DONALDSON, M.D.

Hunt, C. J.: Early Diagnosis and Management of Small Intestinal Obstruction. *Surgery*, 1946, 19: 237.

The purpose of this article is to emphasize the possibility of small intestinal obstruction when abdominal colic not localized to any quadrant or specific viscus in the abdomen occurs. Small bowel obstructions may be divided into the external, on the surface of the abdomen, and those hidden within the abdominal cavity. Those on the surface of the abdomen are strangulated obstructions and are easily diagnosed. The obstructions within the abdomen are hidden from sight and the diagnosis is often delayed, which results in serious complications. The intra-abdominal obstruction of the small bowel may be a simple form of obstruction in which the viability of the bowel is not in jeopardy, or it may be a strangulated or volvulus type in which the blood supply is obstructed and gangrene is imminent. In the former, delay is not so serious as in the latter. Thus, the surgeon is faced with two problems in obstruction of the small bowel: first, a clear distinction must be made as to the probable nature of the obstruction; second, the integrity of the blood supply to the bowel must be considered.

There are some points of diagnostic importance which will aid in arriving at an accurate conclusion. In simple obstruction, rigidity and localized tenderness are not present. When localized tenderness and rigidity are present in small bowel obstruction, it may be stated that a strangulated loop of bowel is present and the blood supply is in danger. The absence of early physical signs suggests the possibility of bowel obstruction. Passage of gas or movement of the bowels does not eliminate the possibility of obstruction. The typical transverse pattern visualized on x-ray examination is not necessary for a diagnosis of small bowel obstruction. Collection of gas in the small bowel of an adult may be considered as synonymous with obstruction, but in very small children gas may be seen in the small bowel and be of no diagnostic significance. Gas appears early after the onset of obstruction and is usually demonstrable within a few hours. The distribution of gas in the small intestine is indicative of the probable type of lesion. In simple obstruction it may be centrally located, with a transverse long axis, while in loop obstruction the dilated loops may assume no definite pattern and proximal bowel distention is slow in developing. If the walls separating

the loops are thick, it signifies the presence of fluid or exudate. Gas may be demonstrated long before distention and the transverse x-ray pattern appears. In postoperative distention there may be a question as to whether a mechanical obstruction or paralytic ileus is present. In the former event, the small intestines are distended, while in the latter there is distention of both the small and large bowel.

The simple adhesive obstructions are the most common types involving the small intestine, and their presence can be detected early by roentgenographic study. Loop obstruction presents an entirely different roentgenographic pattern and a distinct surgical urgency because of impending bowel gangrene. Small bowel obstructions frequently occur in association with inflammatory lesions within the abdomen and usually present the characteristic pattern of a progressive proximal bowel distention in which the viability of the bowel is not in jeopardy. In this type of obstruction it is often not necessary to interfere surgically, as the condition results from localized inflammation and edema which will usually subside. Surgery is attended by great danger to the inflamed edematous bowel and may lead to extension of the infection. Intestinal decompression by intubation and appropriate systemic measures will usually result in recovery. Mesenteric thrombosis is characterized by acute sudden pain and gaseous distribution in the small intestine. Intrinsic lesions obstructing the small bowel are due to the occasional obstruction from a gall stone or incomplete obstruction from a neoplasm. In partial obstructions much difficulty may be experienced in making a diagnosis from the roentgenographic film unless intermittent complete obstruction is present. The use of an opaque medium is an aid to diagnosis in these cases. Any retardation of the barium in its progress through the intestinal tract or the detection of a malformed loop is of great significance. The diagnostic and therapeutic value of the x-ray in intussusception is discussed.

The use of the Miller-Abbott tube is contraindicated as a preoperative measure in loop obstruction, volvulus, or in strangulated obstruction when the viability of the bowel is in jeopardy. It may be employed to advantage in selected cases of intestinal obstruction. The technique of the passage of the tube is described.

An analysis of a series of 41 operative cases of obstruction of the small intestine in which there were only 3 deaths is presented.

JOHN L. LINDQUIST, M.D.

Barney, C. O., Roettig, L. C., and Jones, G. F.: Mechanical Intestinal Obstruction following War Wounds of the Abdomen. *Med. Clin. N. America*, 1946, 30: 337.

The authors state that never before have so many soldiers sustained abdominal wounds and survived to return to civilian life, and never before have so many young adults suffered injuries to, and undergone multiple celiotomies on, their peritoneal cavities. As a result, intestinal obstruction due to adhesions is being encountered with increasing frequency. Mechanical obstruction as a result of abdominal wounds of either the liver or the small bowel was encountered in 1 of every 18.5 cases on the Surgical Service at Rhoads General Hospital, Utica, New York, during the past year. The incidence of obstruction of the small bowel was 3.5 times greater than that of obstruction of the large bowel.

In obstruction of the small bowel, all manner of kinks, torsion, and internal herniations may be encountered. The most common forms are the "fixed kink," the "closed loop," or the "double fixed kink," and the "traction obstruction" with an adhesive band at the apex of a loop of gut acting as an axis about which a volvulus can take place.

In colonic obstruction, the most common finding is an inadequate lumen, often resulting from a Mikulicz type of colostomy closure.

The authors do not await such advanced signs as "the stepladder effect" on either inspection or x-ray examination, nor do they await fecal vomiting. The most common symptoms in obstruction of the small bowel are the onset of increasingly severe intermittent crampy abdominal pains accompanied by nausea, and usually by vomiting. Unless perforation has already resulted or is imminent, marked abdominal rigidity is usually not present. Auscultation of the abdomen is most important. At the onset of obstruction, violent intestinal peristalsis can be heard. Later the abdomen is more quiet and the cracked bell sound is heard. In the roentgen examination, the stepladder effect should not be used as a criterion. The visible distention of an isolated loop or loops of small bowel indicates an obstruction which usually requires surgical intervention.

In large bowel obstruction, the symptoms develop more slowly and are more mild in character. The patient complains of mild abdominal cramps, particularly after meals, abdominal fullness, and often nausea. A history of closure of a colostomy is important. No relief will be obtained with enemas, since the rectum is usually empty. A skiodan enema is of value in localizing the exact point of obstruction, after a flat plate has shown marked distention of the colon proximal to the point of obstruction.

The authors believe that prolonged observation has very little or no part in the treatment of complete mechanical intestinal obstruction following abdominal war wounds. They believe that an early celiotomy offers the most satisfactory means of removing the cause of obstruction and saving the patient's life. Although it is admitted that the Miller-Abbott tube is of definite value in the treatment of inhibition ileus and in incomplete small bowel mechanical obstruction, the authors are opposed to its use in complete obstruction following abdominal war wounds.

In the authors' experience with obstruction following abdominal war wounds, the incidence of strangulation or marked interference of blood supply is far

greater than the usual 10 per cent figure. This is one reason why they are not in favor of the routine use of a Miller-Abbott tube. As soon as the diagnosis is checked by means of positive physical findings and x-ray evidence of a distended loop, Wangensteen duodenal drainage is started. Estimation and correction of the fluid and electrolyte balance are carried out as rapidly as possible. A celiotomy is then performed without further delay. All possible raw surfaces are peritonealized after the strangulated areas are released. When too extensive damage to a loop is noted, resection and anastomosis are done. Postoperatively, Wangensteen suction is continued for at least 48 hours. Penicillin and sulfadiazine are given in adequate amounts. Prostigmine in 1:2000 strength is administered for at least 5 to 7 days postoperatively, starting with one ampule every 3 hours from the first day and gradually decreasing the dosage. Fluid and electrolyte balance are maintained and amino acids and vitamins are administered.

In the treatment of complete obstruction of the colon, it is usually possible to do a primary resection and an end-to-end anastomosis by an aseptic technique. Occasionally it is possible to straighten out an angulation or correct a narrowing of the lumen by longitudinal incision of the bowel and transverse closure. When colonic obstruction is not quite complete, it is often possible to delay operation sufficiently long to administer sulfasuxidine and sulfaguanidine preoperatively. In the authors' series, none of the patients treated in this manner have had an unsuccessful result or postoperative peritoneal infection.

HAROLD LAUFMAN, M.D.

Bottin, J.: Communication between the Duodenum and the Pancreas (Communication entre le duodénum et la pancréas). *Rev. belge sc. med.*, 1942, 14: 13.

The question of a communication between the pancreatic ducts and the bile ducts has gained great importance in the pathogenesis of pancreatic necrosis. A number of experimental and clinical studies have demonstrated a reflux from the duodenum toward the bile and the pancreatic ducts. Pancreatic necrosis has been caused by the migration of parasites from the duodenum into the pancreatic duct, by obstruction of the pancreatic duct by a grain of oat and, in 1 case, by a melon pit. It has been suggested that most of the cases of acute pancreatic necrosis originate from a lesion of the pancreas which causes paralytic duodenal obstruction with paralysis of the sphincter of Oddi, and this in turn allows a reflux of duodenal secretion into the pancreatic duct.

The author reports a series of experimental studies on the dog:

X-ray study. A duodenal obstruction was produced in the dog and was followed by the injection of an opaque solution of sodium iodide into the duodenum. Roentgenograms taken the day after and repeated daily were unsuccessful in demonstrating a reflux toward the pancreatic duct.

Bacteriologic study. Aseptic removal and culture of small portions of the head of the pancreas of the dog almost always yield bacteria of the streptococcus or bacillus perfringens group. A similar excision from the dogs with duodenal obstruction yielded, in addition, the bacillus coli, enterococcus, bacillus tetragenus, bacillus putrificus, and at times, even the bacillus tetani. Since these bacteria are frequently found in the intestine of the dog, a reflux from the duodenum toward the pancreatic duct appears likely.

Enzymatic study. Trypsin occurs in the pancreas in an inactive form. A piece from the duodenal portion of the pancreas of a healthy dog exhibits a very low tryptic activity upon gelatin, graded by index 4. Pancreatic tissue from a dog with duodenal obstruction shows a highly increased tryptic activity, between 1,024 and 5,000. This is probably due to activation of the pancreatic enzymes by a reflux of duodenal kinase. It is unlikely that the kinase has reached the pancreas by the blood stream, because such increased tryptic activity is almost limited to the duodenal portion of the pancreas, and because the remarkable degree of activation observed does not compare with the activation obtainable by blood.

Section of the pancreatic ducts. If the main and accessory pancreatic ducts were cut from 3 to 4 mm. from the duodenal wall and left open, the animal suffered no damage, and an exploratory laparotomy after from 24 to 96 hours showed only a thin peritoneal exudation, due to pancreatic juice which had escaped from the cut ends of the ducts. There was no trace of tissue necrosis. If, on the other hand, the duodenum was obstructed at the same time, the animals succumbed from 48 to 96 hours after the operation. The autopsy revealed necrotic foci in the pancreas, fatty necrosis of the mesentery, and, at times, a diffuse peritonitis. This indicates an activation of pancreatic enzymes by a reflux of kinase from the obstructed duodenum through the cut distal stumps of the pancreatic ducts.

The author concludes that in certain cases of high intestinal obstruction a reflux takes place from the duodenum toward the pancreas.

ARTHUR J. LESSER, M.D.

Larsen, S. B.: Some Cases of Intestinal Tuberculosis in Phthisics, with Reference Especially to the Prognosis. *Acta radiol.*, Stockh., 1945, 26: 117.

The author reports his x-ray findings in 32 cases of intestinal tuberculosis assumed to be secondary to known and proved pulmonary tuberculosis. Histological proof of intestinal tuberculosis was established in 3 cases. All cases were examined by means of the oral administration of barium. The diagnostic x-ray criteria were: hypermotility in 23 cases, filling defects in 32 defects, ileostasis in 15 cases and a positive Stierlin's sign—absence of barium in the affected section of the cecum and ascending colon, while barium is present above and below it—in 1 case. The lesions seemed to be confined to the cecum

and ascending colon in 28 cases, but appeared to extend into the ileum in 4 cases.

All of the cases were treated with total body carbon arc light baths and 1 case also with x-rays. Twenty-one cases were followed up by further x-ray examinations. These subsequent examinations were entirely negative in only 3 cases.

GERHART S. SCHWARZ, M.D.

Gray, H. K., and Sharpe, W. S.: Gastric Retention after Posterior Gastroenterostomy for Duodenal Ulcer; Prevention and Treatment. *Ann. Surg.*, 1946, 123: 397.

A comparative study was made of two groups of consecutive cases of 100 each in which posterior gastroenterostomy for duodenal ulcer was performed. The factors of age, sex, acitivity of lesion, position of stoma, and technical skill were fairly constant. Because of the high incidence of postoperative retention in group 1, changes in the technique of operation and of postoperative care were made in caring for the patients in group 2 in order to combat postoperative gastrojejunitis, to promote peristalsis, and to avoid overloading the stomach. These changes consisted of the use of three rows of sutures instead of two, as well as the postoperative regulation of fluid intake and the administration of medications such as tablets of aluminum hydroxide gel (creamalin tablets), neostigmine (prostigmine methylsulfate), phenobarbital (luminal), atropine, diphenyl acetic acid, and diethylaminoethanol (trasentin).

A comparison of the two groups revealed that the average incidence of retention of any degree decreased from 35 per cent in group 1 to 19 per cent in group 2 and the average incidence of serious retention (persisting longer than 5 days) decreased from 24 to 13 per cent. In the first group 6 patients were subjected to a secondary operation; in the second group there was no necessity for reoperation.

There is no single cause of postoperative gastric retention, so there can be no single remedy. The temperament, racial characteristics, and emotional stability of the patient, as well as his economic and social stresses, are important. The size and position of the stoma, operative technique, and the preoperative and postoperative care are similarly important.

Regurgitant vomiting is of two general types: (1) the vomiting that develops immediately after operation, which suggests mechanical obstruction, and (2) the vomiting that develops between the sixth and tenth days after operation, which occurs most probably because of stomal edema and inflammation. For the first type, some further operative procedure is frequently necessary; for the second type, supportive measures involving a knowledge of the principles of blood chemistry and fluid balance are usually sufficient.

Each surgeon should adopt an operative technique and a program of preoperative and postoperative care that embody the principles which in his hands give good results. In the authors' experience, the stoma is best made on the posterior wall of the stomach with the proximal loop of the jejunum attached near the lesser curvature at the level of the angle of the stomach. The stoma is made to run diagonally downward and to the patient's left toward the greater curvature. Three rows of suture should be used in the anastomosis, the third row solely to allow careful approximation of the mucosal edges and to cover all denuded portions. The distal loop should be carefully replaced in the abdominal cavity to lie behind all other loops of bowel. If a secondary operation is considered, jejunostomy alone is the procedure of choice and is usually all that is necessary.

Crook, E. A.: Nonspecific Intestinal Granuloma. *Proc. R. Soc. M.*, Lond., 1946, 39: 123.

In reporting 5 cases of intestinal granuloma or regional ilietis, Crook emphasized the varied clinical picture which this condition may assume. Severe hemorrhage was the chief symptom in 2 instances and fistula in 2 others, while abdominal pain associated with a tumor mass was the predominant complaint of the fifth patient.

The cause of the disturbance was obscured in each case and operative treatment failed to arrest the pathological process. The histologic appearance of the tissues and the liability of the disturbance to recur after operation seemed to point to an infection as the causative agent, the true nature of which was undiscovered. The topic was enlarged upon by Manson-Bahr, who emphasized that the pathological process can be divided into various stages:

Stage of acute suppuration. The affected length of the bowel is dark red in color and greatly thickened and there are usually yellow shreds of fibrin adherent to the inner mucosa. The nearby glands are enlarged and red in color. There is free, sometimes turbid, fluid in the peritoneal cavity. Miliary abscesses sometimes found in the submucosa resemble those seen in full blown phlegmonous gastritis.

Chronic stage. Descriptions of this stage are commonly found in the literature. The appearance of the affected bowel to the naked eye is typical and corresponds to Dalziel's simile of an "eel in a state of rigor mortis," or it is more commonly referred to as the "hosepipe appearance." The serous surface of the bowel has a grayish pink color with white, thickened patches representing organized fibrin. The terminal portions of the affected loop are often affixed to the pelvic brim by recent adhesions.

The fibrostenotic stage. In this stage the cellular structure has largely been replaced by fibroblasts which have laid down collagen fibers, and these have produced marked narrowing of the area. It is this stenosis which gives rise to the roentgenographic "string sign of Kantor." As this constriction advances, the blood and lymphatic supplies of the bowel are interfered with and widespread ulceration of the mucosa takes place.

Fistula formation. As originally pointed out by Crohn, there is a marked tendency toward the formation of fistula and this may precede even the initial symptoms. These fistulas sometime travel a long distance before they reach the surface. It has been suggested that they may be of chemical origin, due to the action of the intestinal juices or possibly to the virus of lymphogranuloma inguinal.

In the discussion of the etiology it was stated that the chronic stages of Crohn's disease have certain resemblances to tuberculosis of the hyperplastic type, but no subserous tubercles have ever been demonstrated. The general form of the lesions in the large bowel, when these are encountered, bears a resemblance to the intestinal phenomena of lymphogranuloma. Moreover, phlegmonous enteritis has the same pathological picture as that of Crohn's disease and its resemblance to phlegmonous gastritis has already been observed. From a correlated study, positive cultures of bacillus dysenteriae, Flexner and Sonne, were obtained during the acute and positive agglutination tests in the chronic stages, which indicated a dysentery association. It has been suggested that chronic ileitis might be related to sarcoidosis. With this object in view, a skin lesion from a proved case of sarcoidosis was emulsified: this gave positive intradermal reactions in 2 cases of sarcoidosis and also in 2 cases of regional ileitis.

By the injection of various sclerosing agents into the mesenteries and subserosal lymphatic channels and the introduction of bacteria intravenously at the same time, edema and extensive infiltration of the bowel wall can be produced; this suggests a low grade lymphatic infection. However, this has been interpreted as showing that disease of the mesenteric glands might be primary and that the ileitis might be due to the lymphatic block. Moreover, a streptococcus of the enterogenous type may be isolated from the floor of the ulcers as well as from the peritoneal fluid. If the bacterial nature of the disease is accepted we must be prepared to explain the mode of entry. The ulceration might well prove the site of entry of the primary infection. Trauma such as fish bones may be the cause.

At present, histological study remains the only safe means of identifying the lesion, which appeared to be the result of hyperplasia of the lymphoreticular tissue leading to obstructive lymphedema. The lymphadenoid masses vary in size, the largest forming cellular aggregates from 3 to 4 mm. in diameter and being visible to the naked eye. The smallest are 0.4 mm. in diameter and microscopic in size. In three-quarters of the cases these cellular nodes are scattered evenly throughout the edematous mucosa, ranging from 8 to 18 to the square centimeter. They show considerable cellular activity, a characteristic cellular response in a variable number of germinal centers making up a nodule of lymphadenoid tissue. The affected germinal center is later replaced by proliferating endothelial cells with weakly staining nuclei. In the midst of the cells constituting endothelial aggregates it is usually possible to find a Langhans' giant cell which, when mature, resembles the giant cell system of miliary tuberculosis, but when this system has reached its full development, all proliferation apparently ceases. Never has the slightest evidence of caseation been seen. Some of the cells contain crystalline masses of various shapes and sizes. Probably the most arresting histologic feature is the presence in the regional lymph nodes of a clear cut specific formation of giant cell systems identical with those of the thickened mucosa. The natural retrogression of this lesion can best be studied in this situation. When viewed as an isolated and static histologic picture, the giant cell systems, both in the glands and the bowel, are indistinguishable from those of tuberculosis, but the absence of caseation and of acid fast bacilli force one to doubt their tuberculous origin.

From the purely histologic aspect, the appearance, evolution, and retrogression of the giant cell system of Crohn's disease resembles more the tissue reaction of Boeck's sarcoidosis than tubercle infection.

STEPHEN A. ZIEMAN, M.D.

Atwood, W. G.: Meckel's Diverticulum. *N. England. J. M.*, 1946, 234: 329.

Meckel's diverticulum is found in from 2 to 3 per cent of all autopsies, and about 3 times as often in males as in females. It is usually found from 30 to 45 cm. proximal to the ileocecal valve, but it may occur at any point between the pylorus and the ileocecal valve, usually arising opposite the attachment of the mesentery. Intestinal obstruction caused by a diverticulum is very rare; it may be caused by an obliterated omphalomesenteric duct forming a fibrous band constricting the bowel, or the diverticulum itself may cause constriction if its tip is attached to some point in the peritoneal cavity, or if the diverticulum is very long. The diverticulum may also invaginate itself and start intussusception; this is frequently facilitated by a polyp present in the diverticulum, or else a free diverticulum may be inverted as a whole.

Thirty-seven cases of Meckel's diverticulum have been recorded at the Truesdale Hospital in 69,000 admissions; only 1 case of intussusception as a result of inversion of the diverticulum was observed:

A case of a 7 year old boy is reported; he had complained of severe abdominal pain, nausea, and vomiting 2 days prior to admission. On admission the patient was cyanotic, and his general condition was extremely poor with a temperature of 100.6°F., pulse 130, respirations 22, labored; the abdomen was markedly distended, tympanitic, and tender, and no peristalsis was heard. Urinalysis showed a trace of albumin, hyaline casts, and pus cells; the hemoglobin was 80 per cent, the red blood count was 4,440,000, and the white blood count was 14,650 with 69 per cent neutrophiles, 20 per cent lymphocytes, 2 per cent large mononuclear leucocytes, 8 per cent band forms, and 1 per cent metamyelocytes.

The patient was very restless on admission, and was given 1,000 c.c. of 5 per cent glucose in saline

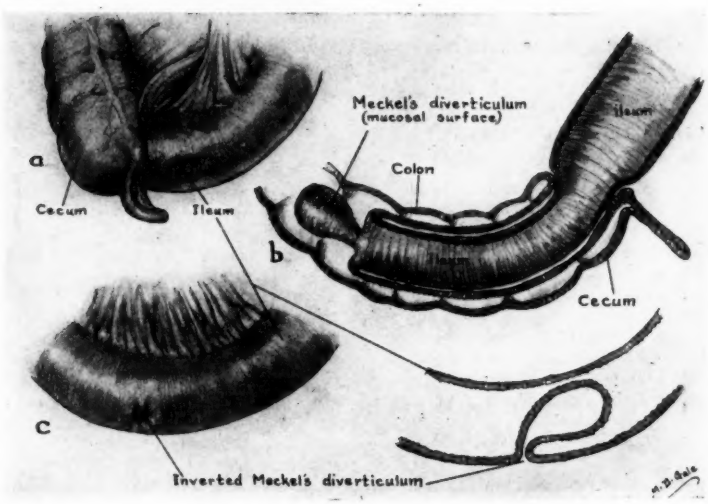


Fig. 1.

solution by rectal clysis prior to surgery. Under nitrous oxide, oxygen, and ether anesthesia, the abdomen was opened through a right rectus incision. A considerable amount of foul smelling fluid was encountered in the abdominal cavity and the small intestine was markedly distended. The terminal ileum was found to be prolapsed into the cecum through the ileocecal valve, as shown in Figure 1 a. Figure 1 b explains the mechanism of intussusception. The intussusception was reduced and an inverted Meckel's diverticulum was found at the apex (1 c). In spite of supportive measures, such as oxygen and intravenous fluids, the patient died an hour after operation. Permission for an autopsy could not be obtained.

The authors stress the need of early diagnosis and surgery in these cases, while the patient is still a good risk; they also recommend the search for a Meckel's diverticulum at every laparotomy.

ARTHUR J. LESSER, M.D.

Dixon, C. F., and Benson, R. E.: External Fecal Fistulas. *J. Am. M. Ass.*, 1946, 130: 755.

Early operation for the elimination of external fecal fistulas is usually not advisable.

Many fistulas close spontaneously with conservative, nonsurgical treatment.

In the early, acute stages of the formation of fecal fistula, treatment consists in transnasal intestinal suction, warm applications to the affected area, and adequate parenteral fluid, solution of glucose, saline solution, and vitamin replacement therapy. Parenterally administered sulfonamide compounds and blood transfusions may be of value.

In the subacute stage, efforts are directed toward eliminating the residual perifistulous inflammation, decreasing the passage of intestinal contents through the fistula, and improving the patient's general condition.

Before instituting definitive surgical treatment for chronic persistent fecal fistulas, the following conditions should be met if possible. The etiological factors which are responsible for persistence of the fistula should be determined; the segment of intestine from which the false communications have their origin should be determined; it should be known whether the bowel distal to the lesion is patent; an adequate trial of conservative management should have been made; the general condition of the patient should be evaluated; all evidences of acute inflammation about the fistulous tract should have subsided.

Conservative surgical treatment, such as short-circuiting or sidetracking procedures, is used when the patient cannot meet the prerequisites for a more extensive, direct surgical approach.

In applying resection methods in the treatment of persistent, external fecal fistulas, the incision should, when possible, encircle and excise the fistulous tract; in most cases the results will be best if the peritoneum is opened and the affected segment of bowel is mobilized and inspected; all diseased tissue should be removed.

The types of persistent external fecal fistulas in which treatment is most difficult are (a) those in which the patient is a woman and the original pathological condition was pelvic inflammatory disease with pelvic peritonitis, (b) those in which the fistula arises in a region affected by severe diverticulitis with perforation, (c) those in which the fistula passes through bone, and (d) those in which the fistula is associated with enteroabdominal actinomycosis.

In the 65 cases of persistent external fecal fistulas of this series, in each of which treatment was surgical, there were 2 hospital deaths (3 per cent).

CHARLES BARON, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

McNamara, W. L., Baker, L. A., and Costich, K.: Aneurysm of the Hepatic Artery. *Ann. Surg.*, 1946, 123: 427.

The authors report the case of a 44 year old man who was admitted to the hospital because of rheumatic heart disease, cardiac enlargement, and auricular fibrillation. While in the hospital he developed jaundice and a mass was palpable below the liver's edge. At operation the mass was found to be posterior to the gall bladder and ducts. Aspiration revealed blood and the diagnosis of aneurysm of the hepatic artery was made although the mass did not pulsate. No further surgery was attempted because of the patient's cardiac condition. The patient died 10 days after operation because of perforation of the aneurysm of the hepatic artery. There was no evidence of syphilis.

In reviewing the literature the authors found the suggestion that the artery be ligated because as the aneurysm develops, collateral circulation develops by way of the inferior phrenic artery. The mortality rate following ligation of the hepatic artery has been about 75 per cent in cases of aneurysm and about 60 per cent in conditions other than aneurysm.

EARL O. LATIMER, M.D.

Efskind, L.: Liver Changes in Surgical Conditions. *Acta chir. scand.*, 1946, 93: 81.

The author studied, by means of liver biopsies, the liver changes in surgical conditions. Biopsies were taken from the left lobe of the liver by means of a sharp instrument at the beginning and at the conclusion of operations. The specimens were examined for glycogen and fat content. The behavior of the mitochondria was scrutinized, while an attempt was made to study the circulatory condition from the appearance of the sinusoids. The author also observed the general cytological conditions in the liver cells themselves and the interlobular formations. The liver biopsies from a group of 120 patients were studied.

It was found that in patients with various serious disorders in the intestinal tract histological changes of a regressive nature were present in the liver cells. These changes were most pronounced in patients with protracted nutritional disturbances, hypoproteinemia and anemia, and in those with disorders of the liver and bile ducts. Topographically, these changes occurred at certain places of predilection in the lobuli of the liver and were considerably accentuated during severe operations. Also normal livers may show the same changes after severe operations, but in a minor degree. These changes occur in the following order:

a. Abnormal mobilization of the liver glycogen
b. Mitochondrial changes of a regressive nature
c. Interstitial lymphoctye infiltration, sometimes with fibrosis
d. Fat infiltration of the liver cells

The changes in the liver cells appear earliest and are most pronounced in the central parts of the lobuli. The fat infiltrated cells may often be well supplied with glycogen and frequently maintain their glycogen deposit for a long time, probably because of a kind of cellular blockade. The same may be seen in cases of chronic icterus and of considerable degenerative changes in the liver cells. Patients in whom the liver, in spite of adequate preliminary treatment, contains little glycogen and much fat show an abnormally great postoperative fall in serum proteins, with an inordinately long restitution time. The Kupffer cells show proliferative changes and in many cases a deposition of pigment or fat. The interstitial hepatitis seems to have arisen on a vascular, probably lymphogenic basis. Cholangitic infection has not been observed, even in cases of choledochal occlusion with infection.

EARL O. LATIMER, M.D.

Hudson, P. B., and Johnson, P. P.: Hemorrhage from the Gall Bladder. *N. England J. M.*, 1946, 234: 438.

The authors report 4 cases of hemorrhage into or from the gall bladder. Prior to this report 24 case reports appeared in the literature.

The first patient was 57 years old and had a severe anemia and melena of undetermined origin. X-ray examination of the gastrointestinal tract did not reveal any lesion, but the gall bladder was diagnosed as being diseased. The gall bladder was removed, and it was found to be distended and filled with stones and blood clots. The pathological diagnosis was malignant hemangioendothelial sarcoma.

In the 3 other cases blood was found in the gall bladders which also contained stones; in addition there was an acute or chronic cholecystitis.

EARL O. LATIMER, M.D.

Rienhoff, W. F., Jr., and Pickrell, K. L.: Pancreatitis; An Anatomic Study of the Pancreatic and Extrahepatic Biliary Systems. *Arch. Surg.*, 1945, 51: 205.

The authors examined the pancreas of 250 adults, both fresh and fixed specimens. The main and accessory pancreatic ducts were dissected out. In 73 instances (24%) they could find no junction of the pancreatic and bile ducts. In 92 specimens (37%) the common bile duct and the pancreatic duct were contiguous, and the dividing septum terminated from 1 to 2 mm. from the apex of their common orifice. In this group, however, a true ampulla was not considered present. In 81 instances (32%), a true ampulla was present, varying in length from 3 to 13 mm., while in 4 instances (2%), the main pancreatic duct was reduced to a fibrous cord. In 47 instances (18%), the length of the ampulla exceeded the

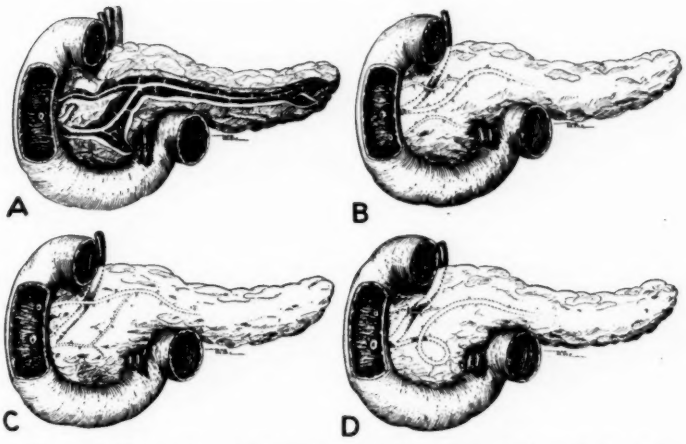


Fig. 1. A, The most constant arrangement of the pancreatic ducts. B, Specimen with three papillae. C, Dissected specimen of an adult pancreas showing an embryonic type of duct system in which the accessory duct carries most of the pancreatic secretion. D, Dissected specimen of an adult pancreas showing an unusual loop configuration of the main pancreatic duct.

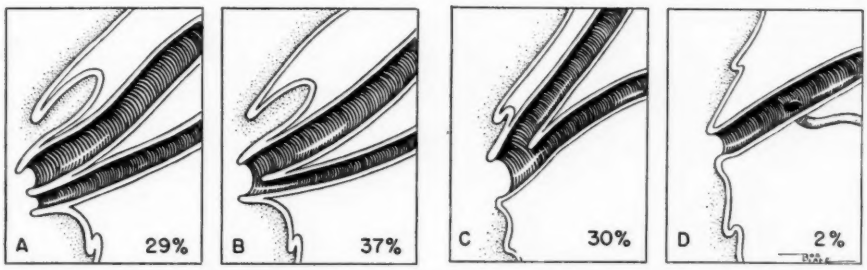


Fig. 2. Variations of the entrance of the main pancreatic duct into the common duct.

average diameter of the duodenal orifice and a complete block at the papilla would convert the two ducts into a communicating system.

The average diameter of the duodenal papilla was 3 mm., with limits of 1.5 and 4.5 mm.

Concerning the accessory pancreatic duct, in only 89 of 100 specimens studied for this purpose could any intraglandular communication between the ducts be demonstrated. In 4 instances the embryonic duct system was present, i.e., the accessory duct carried the greater part of the secretion, while the main duct was reduced to a fibrous cord; 85 specimens had a normal duct arrangement. In only 62 of these (73%) was the duct found to be patent; in other words, there were 23 instances in which the accessory duct did not communicate with the duodenum, regardless of the duct arrangement; this made a total of 34 per cent in which fluid could not pass from the main pancreatic duct to the duodenum by way of the ac- cessory duct. The average diameter of the undistended duct at the duodenal perforation was 1.6 mm. EARL O. LATIMER, M.D.

Reyes, H.: Acute Pancreatitis and Splanchnic Block (Pancreatitis aguda y bloqueo anestesico del esplacnico-semilunar). *Arch. Soc. cir. hosp.*, 1945, 15: 723.

Three cases of pancreatitis in which lumbar sympathetic block was exhibited are reported. Two cases were operated upon, one presenting gallstones and inflammatory changes about the sphincter of Oddi and the other requiring drainage of an abscess which was secondary to a hemorrhagic type of acute pancreatitis. The third case was considered mild and treated conservatively. A diagnostic and therapeutic approach is given in view of these experiences.

When acute pancreatitis is suspected, the necessary laboratory studies, including those of the

amylase values of the blood and urine, are made. A lumbar sympathetic block is done, which presumably alleviates pain and shock. This permits an air contrast x-ray study of the stomach, to visualize the changes which have occurred in the region of the pancreatic shelf. These steps being promptly carried out, information concerning the type of pancreatic involvement is obtained and the type of therapy is indicated. The block is believed to favorably affect the local disease process, promote drainage of bile by its effect on the sphincter of Oddi, and lead to general improvement by interrupting impulses originating at the site of the disease.

Roentgenographic illustrations of the pneumogastrographic findings are appended to the relatively detailed case report. HIRAM T. LANGSTON, M.D.

Curtis, G. M., and Movitz, D.: The Surgical Significance of the Accessory Spleen. *Ann. Surg.*, 1946, 123: 276.

The end-result of splenectomy for certain diseases involving the formed elements within the blood, and particularly for congenital hemolytic icterus or primary thrombocytopenic purpura, is influenced by whether accessory spleens which may be present are found and removed. That the unremoved accessory spleen may eventually cause a recurrence of either congenital hemolytic icterus or primary thrombocytopenic purpura subsequent to splenectomy is established by observation of three types: first, recurrence associated with an accessory spleen found, but not removed, at the time of splenectomy, since its significance was not then recognized; second, recurrences associated with accessory spleens overlooked at the time of splenectomy, but subsequently found at autopsy, after the patient had died of recurrence; and third, the most convincing of all, relief from a recurrence by the surgical removal of accessory spleens at a second operation.

The authors' report is based on 174 consecutive splenectomies, and on 4 explorations for splenic disease. One hundred and thirty-one accessory spleens were found in 56 of these patients, an incidence of 31.4 per cent. The two diseases for which the accessory spleen should be removed to prevent recurrence, namely, congenital hemolytic icterus and primary thrombocytopenic purpura, were also the two most frequent indications for splenectomy, which was performed in 53 and 33 instances, respectively.

In general, there is a greater incidence of accessory spleens among young persons. In the authors' cases there was an incidence of 50 per cent among patients in the first decade, and of 39.1 per cent among those in the second decade, which is greater than the increased incidence of accessory spleens ordinarily found in the young with "normal" spleens. In patients with hemolytic icterus, accessory spleens occurred in 57.1 per cent of those in the first decade, and in 42.8 per cent of those in the second decade of life. In patients with primary thrombocytopenic purpura, accessory spleens were found in 44 per cent of those in the first decade and in 33.3 per cent of those in the second decade. The number of accessory spleens per patient varied from 1 to 10, 26 patients presenting but 1 accessory spleen. The size of the accessory spleens herein described ranged from 2 mm. in diameter to 3 by 2 by 2 cm.

A condition referred to as "splenosis," in which splenules in great numbers are scattered throughout the peritoneum appears to be a different clinical entity than true accessory spleens. Usually they originate by transplantation of fragments of splenic tissue, scattered about the peritoneum by hemorrhage from a ruptured spleen. This mechanism becomes of clinical significance during splenectomy for primary splenic disease, since the spleen may be accidently torn either during manipulation or dislocation of capsular adhesions. Autotransplantation may thus occur from the fragments, and in a patient with congenital hemolytic icterus it is reasonable to assume that such might result in a recurrence. The authors believe that 1 case of this type has been reported in the literature although it was not originally so identified (McLaughlin, C. W., Jr. *Surgery*, 1942, 12: 419–425). Moreover, since splenic substance may even transplant to subcutaneous tissues, the incision should be protected during splenectomy in the event that the spleen is traumatized.

To avoid overlooking accessory spleens, a routine search should be made after the major spleen has been removed, and hemostasis effected in the following approximate order: (1) the hilar region; (2) the splenic pedicle; (3) the retroperitoneal region surrounding the tail of the pancreas; (4) the great omentum, and especially along its attachment to the greater curvature of the stomach; (5) the splenocolic ligamentary attachments; (6) the mesentery of both large and small intestines; and (7), in the female, the left adnexa. Because in 3 of 4 proved recurrences the overlooked accessory spleens were later found in the retroperitoneal region, about the tail of the pancreas, this area should be searched with special care.

In this series of cases the accessory spleens were distributed as follows: hilar, 54.2 per cent; pedicle, 25.1 per cent; omentum, 12.2 per cent; retroperitoneum, 6.1 per cent; splenocolic ligament, 1.5 per cent; and bowel mesentery, 0.75 per cent. In 85.7 per cent of the patients, the accessory spleens were found in but a single location, and in only 8 instances were accessory spleens found in two different locations. In all instances of double location, the hilus constituted one location. Consideration of the embryonic development of the spleen provides an understanding of the occurrence of accessory spleens as well as their various locations. Even left scrotal and mediastinal splenic masses may occur.

In 2 cases there was a recurrence of the disease following splenectomy, which was attributed to accessory spleens. One patient had primary thrombocytopenic purpura that recurred 2 years after splenectomy; at autopsy, 2 accessory spleens were found in the retroperitoneal region near the tail of the pancreas. The other patient had congenital

hemolytic icterus that recurred about 4 years after splenectomy. At a second operation, 2 small accessory spleens were removed from the retroperitoneal tissue over the tail of the pancreas. Two years later the patient remained free from any evidence of recurrence of the disease.

Two cases from the literature are briefly summarized; in both cases accessory spleens were found and appeared to be the cause of recurrence.

Pedunculated accessory spleens may cause acute abdominal symptoms from infarction due to pedicle torsion, and this is shown in a summary of 2 such case reports obtained from the literature (Settle, E. *Am. J. Surg.*, 1940, 50: 22–26).

CHARLES A. WALTMAN, M. D.

MISCELLANEOUS

Gordon-Taylor, G.: The Last 'Hate.' *Brit. J. Surg.*, 1946, 33: 230.

This article is an account of abdominal injuries sustained from the V1 and V2 bombs and the shelling of Dover. These injuries, fortunately, were not numerous—only 120 patients being submitted to operation. Of the 79 patients submitted to operation with intraperitoneal vesceral injury due to the V1 flying bombs, 60 recovered (76%). Of the 13 explored in whom hematoperitoneum was found without visceral injury, 1 succumbed. The V2 rocket bomb caused 16 cases of intraperitoneal injury with 9 recoveries (56.2%). Of 6 patients with intraperitoneal injuries received during the shelling of Dover, 1 died postoperatively. Cases of "crush syndrome," retroperitoneal hematoma, and nonpenetrating abdominal wounds are not included in these figures.

Injuries due to the flying bomb were less serious than those due to high explosive bombs. Property damage was greater than the damage to people, and casualties were usually secondary to the blast effects on buildings. Many writers have commented on the infrequency of intra-abdominal injury as a result of V1 explosions. Of the 79 patients in this series, 14 had no external wound and were suffering from intra-abdominal damage produced by blast or the collapse of buildings. A high percentage of wounds were due to splintered glass, and in this series most of the abdominal viscera were on occasion damaged by glass—the intestines, liver, spleen, the left gastric artery, and the pregnant uterus.

Of the 92 patients in this series who were submitted to laparotomy, 50 were females. The author presents 2 cases in which the fetuses were injured in utero and died later. Eight patients were under 10 years of age and 8 over 65. The eldest, 86 and with numerous intestinal wounds, died on the operating table. The flying bomb seemed to have a predilection for children, and the author presents the histories of 2 cases of blast injuries, 1 patient aged 7 and the other 15. At operation both had a hematoperitoneum without visceral damage, and both patients recovered.

The author refers to Kidd's case of successful suture of the inferior vena cava, previously reported in the *British Journal of Surgery* (1945).

A case is presented of a woman who claimed that a flying bomb fell on her. A wound of her right buttock communicated with her abdomen, and she was in shock. At operation, hematoperitoneum, bruising of the sigmoid colon and mesosigmoid, and a 3 inch tear in the serous and muscular layers of the sigmoid were found. The operation was quickly terminated because of the patient's poor condition. At reoperation the next day more blood had collected in the abdominal cavity but the bowel was all viable and no more lesions were found. The patient ultimately recovered.

Three cases are presented of patients who were hospitalized at the time they received their abdominal injury from the V1 bombs. Two of these recovered.

The author has 3 cases in his series of abdominal injury due to antiaircraft fire during the V1 phase. He gives the case history of a 68 year old warden with an abdominothoracic wound with recovery. A piece of metal entered the epigastrium and passed through the diaphragm and pericardium to lodge in the right ventricle. This was removed and the wound in the heart sutured. The patient recovered and was able to resume his ordinary duties troubled only slightly with dyspnea.

Of the 16 abdominal visceral injuries due to the V2 bomb which were submitted to operation, about one-half were due to crushing with associated fractures of the pelvis and other bones. Several dramatic cases are presented. A 52 year old woman had her abdomen impaled by a rafter beam which entered the right lumbar region below the 12th rib and projected out of the abdominal wall in the left iliac fossa. The greater omentum was traversed but both the large and small bowel were only bruised and not lacerated. This patient recovered from this wound without the development of a herniation. A case of a railway man crushed between two railway trucks at the moment of a rocket incident is presented. He recovered after 8 feet of small intestine were resected and a laceration of the bowel was sutured. A 12 year old girl recovered after exteriorization of the colon because 5 or 6 inches of the mesosigmoid had been separated from the bowel by the blast of a V2 bomb. A case is presented in which severe damage to the liver and free portions were found in the abdominal cavity. The patient, a 15 year old boy, recovered. A woman recovered from a fragment wound in the right hypochondrium which shattered the eighth and ninth ribs and caused herniation of the liver, gall bladder, and colon through the wound.

Several cases of abdominal injury due to the shelling of Dover are presented. An American soldier recovered from multiple injuries caused by an exploding shell, a fragment of which penetrated his abdomen and passed through both walls of the stomach. Postoperatively, he developed intestinal obstruction and had to undergo a second laparotomy

for relief from the adhesions. Subsequent recovery was uneventful. A remarkable plastic result was achieved by Rainsford Mowlem in a case of a woman with a severe perineal wound due to a shell fragment. He successfully reconstructed the vaginal and anal orifices.

A very remarkable recovery of a patient of the author is presented. A 39 year old woman was wounded in the upper left abdomen. The liver and everted stomach were visible through the anterior wound. Through the posterior exit wound, the colon protruded. The patient had numerous other puncture wounds of both legs. At operation, 3½ hours after wounding, several tears in the liver were sutured. The spleen which was pulped was removed, a partial detachment of the diaphragm was repaired, and a 6 inch longitudinal tear in the stomach which led to the turning inside out of the viscus was sutured. The patient ultimately made a good recovery.

ROBERT R. BIGELOW, M.D.

Newson, A., Watson, D., and Rose, T. F.: Early Results in a Short Series of Cases of Gunshot Wounds of the Abdomen. *Med. J. Australia*, 1946, 1: 180.

The authors present 27 cases of wounds of the abdomen which were treated in a forward unit in the Southwest Pacific area. The wounds were from 4 to 16 hours old when seen, and were caused by rifle bullets, machine gun bullets, mortar, high explosive, grenade or land mine fragments.

The treatment is briefly discussed, with emphasis on resuscitation by blood transfusions and blood plasma. The operative treatment of the 23 cases requiring laparotomy was not described. The postoperative treatment included gastroduodenal drainage, fluids, plasma, blood transfusions, and penicillin intramuscularly.

Nine patients had solid visceral injuries only. Of these, 6 had an uneventful convalescence. Two patients developed a wound infection and a biliary fistula, but ultimately recovered. One patient with a shattered liver died from irreversible shock.

Eighteen patients had wounds of the bowel. Of these, 5 recovered without complications: 4 had pulmonary emboli or intra-abdominal infection, but recovered: and 9 died (2 from irreversible shock, 2 from traumatic uremia, 1 from a hyperpyrexia, 2 from fecal peritonitis, 1 from an associated penetrating wound of the brain, and 1 following removal of the remnants of his only kidney—congenital absence).

Of the patients who recovered, 10 were back at their regular jobs in from 2 to 3 months, 1 was discharged from the Army as fit for sedentary work, and the other 4 were either in convalescent depots or about to be sent there, 3 months after being wounded.

THOMAS C. DOUGLASS, M.D.

Thornton, T. F., Jr., Storer, E. H., and Dragstedt, L. R.: Supradiaphragmatic Section of the Vagus Nerves. *J. Am. M. Ass.*, 1946, 130: 764.

Following extensive studies of the effect of supradiaphragmatic section of the vagus nerves on gastric secretion and motility in patients with peptic ulcer, the authors conclude that:

1. The continuous night secretion of gastric juice in the empty stomach of patients with gastric and duodenal ulcers is usually much greater than in normal man.

2. This hypersecretion is chiefly neurogenic in character, and is much reduced by section of the vagus nerves to the stomach.

3. The empty stomach of ulcer patients often displays a hypertonicity and hypermotility, with exaggerated hunger contractions, and these are returned toward the normal state after bilateral vagotomy.

4. Complete section of the vagus nerves to the stomach in man abolishes the secretion of gastric juice produced by a sham meal or by insulin hypoglycemia, but has little or no effect on the response to histamine or caffeine. The absence of a secretory response to a sham meal or to insulin hypoglycemia is evidence that section of the vagus nerves to the stomach has been complete. CHARLES BARON, M.D.

GYNECOLOGY

UTERUS

Fahlund, G. T. R., and Broders, A. C.: Postmenopausal Endometrium and Its Relation to Adenocarcinoma of the Corpus Uteri. *Am. J. Obst.*, 1946, 51: 22.

The question of whether a given malignant neoplasm passes through a premalignant phase is often raised, and hence should be considered as fundamental. Since the problem obviously is closely allied with early diagnosis and treatment, the question is not purely academic, but practical as well. Thus, if a premalignant phase could be definitely established, physicians could strive to diagnose the condition during this period and eradicate it, with consequent prevention of the malignant neoplasm. The foregoing fundamental question prompted a study of the postmenopausal endometrium and its relation to adenocarcinoma of the corpus uteri.

The material studied consisted of postmenopausal uteri in 236 cases. In 86 of the cases the uterus had been removed because of adenocarcinoma, and in 100 cases it had been removed for other reasons. In 50 cases routine necropsy had been performed.

In the group of 86 women who had adenocarcinoma of the corpus uteri, all but 1 had had vaginal bleeding or spotting as a presenting complaint.

In the 86 cases of adenocarcinomatous uteri, there was no appreciable variation in the percentage of cases with proliferative endometrium, whether early or late, or in the percentage of cases with atrophic endometrium, according to the grade of malignancy.

There was no appreciable difference in the percentage of cases of any given type of endometrium in adenocarcinomatous uteri as compared with nonadenocarcinomatous uteri, except with regard to atrophic endometrium. Thus, 41.8 per cent of cases of uteri with malignancy showed atrophic endometrium, and only 16 per cent of cases of uteri without malignancy showed atrophic endometrium. This suggests that adenocarcinoma of the uterine corpus is more likely to occur in cases in which there is atrophy of the endometrium than in cases in which there is no atrophy.

Two of the 86 cases of adenocarcinomatous uteri, and 3 of the 150 cases of nonadenocarcinomatous uteri presented some features similar to those found in early differentiative endometrium, but since they were not entirely the same the endometrium was classified as late proliferative.

The percentage of cases with cystic change (grades 3 and 4) and with accumulation of secretion (grades 3 and 4) was roughly the same in the two groups of cases. Approximately 42 per cent of adenocarcinomatous uteri showed no cystic changes, whereas 20 per cent of nonadenocarcinomatous uteri showed no cystic changes. This lends evidence which is contrary to the view that the "swiss-cheese endometrium" of Novak has any features predisposing to the development of carcinoma.

There was no consistent difference or variation of cystic change, accumulation of secretion in the glands, density of the stroma in and beneath the endometrial epithelium, involvement of the subbasal glands, or sclerosis of the arteries and arterioles, according to the grade of adenocarcinoma. In 28 of the 86 cases, no sub-basal glands were found. Thus, sub-basal glands seem to have no causal relationship to adenocarcinoma of the uterus.

There was virtually no difference in average thickness of endometrium in adenocarcinomatous uteri, compared with nonadenocarcinomatous uteri.

The incidence of endometrial polypi in uteri without adenocarcinoma was, roughly, eight times greater than their incidence in uteri containing adenocarcinoma. However, previous curettage in all cases of malignancy might be partially responsible for the variation.

In general, it may be concluded from this comparison of adenocarcinomatous and nonadenocarcinomatous uteri removed from women who had passed the menopause, that the uninvolved portion of endometrium in the former group was in no demonstrable way different from that of the endometrium in the latter group except that atrophic endometrium was found more often in adenocarcinomatous uteri than in nonadenocarcinomatous uteri, while endometrial polypi were found more often in nonadenocarcinomatous uteri.

Stowe, L. M.: A Histological Study of the Effect of Irradiation on Adenocarcinoma of the Endometrium. *Am. J. Obst. Gyn.*, 1946, 51: 57.

The literature dealing with the detection of residual tumor and its frequency in adenocarcinoma of the endometrium treated with radium, radon, and deep x-ray therapy was reviewed by the author. The reports show persistence of apparently viable tumor in from 12.5 to 89 per cent of the cases. There was wide variation in the amount of therapy given, in the type of radium or radon applicators used, in the intervals between irradiation therapy and operation, and in the thoroughness of the search for residual tumor in the operative specimens.

The incidence of residual tumor in the uteri of the 53 patients studied was 50.9 per cent. All of these patients were given intrauterine applications of radium; 23 had deep x-ray therapy as well. In a small series in whom x-rays were employed in adequate dosage together with radium irradiation, the incidence of residual tumor fell to 40 per cent, while in a larger series in which radium alone was used, the incidence was 56.5 per cent.

An applicator designed to overcome the effect of variations in size and shape of the uterine cavity is described. It was used in 46 of the 53 cases.

In the majority of instances in which residual carcinoma was found, it was seen in the musculature of the uterus. The significance of this is discussed.

In view of the fact that tumor persisted after irradiation in a high percentage of cases, and especially in view of its frequency in the myometrium, it is concluded that surgical attack must be considered the essential feature of curative therapy in the treatment of adenocarcinoma of the corpus uteri. It is still possible that preliminary irradiation may be useful as additional therapy or for palliation.

EDWARD L. CORNELL, M.D.

Corscaden, J. A., Fertig, J. W., and Gusberg, S. B.: Carcinoma Subsequent to the Radiotherapeutic Menopause. *Am. J. Obst. Gyn.*, 1946, 51: 1.

Among 958 patients treated for benign uterine bleeding by induction of the radiotherapeutic menopause and followed up for an average of 6.7 years each, there subsequently occurred 15 carcinomas of the uterus. Based on the modified mortality statistics, the same number of women in the general population during the same length of time should contract 4.4 carcinomas of the uterus. The observed number of cases is therefore 3.4 times as large as the number expected.

Two and eight-tenths per cent of the women in the general population between the ages of 30 and 55 years contract cancer of the uterus before reaching the age of 80. Applying the ratio of 3:4, we find that 9.6 per cent of the women suffering from uterine bleeding prior to the menopause would contract it.

Of 15 cases, 9 were of the corpus and 6 of the cervix. This abnormal preponderance of carcinoma of the corpus is in agreement with that present in other reported cases in which the ratio is 2 of the corpus to 1 of the cervix. This ratio of corpus to cervix is 6 times that obtaining in the clinic.

It is inferred that the endometria of uteri which bleed abnormally prior to the menopause are predisposed to the subsequent development of carcinoma of the corpus.

Prophylaxis against carcinoma of the uterus should be an important factor in a plan of treatment for uterine bleeding prior to the menopause.

EDWARD L. CORNELL, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Cianfrani, T.: Neoplasms in Apparently Normal Ovaries. *Am. J. Obst. Gyn.*, 1946, 51: 246.

The author has examined the ovaries at all operations in which this was possible in the service of the Graduate Hospital, Philadelphia, Pennsylvania, and in the past 3 years the following tumors were found in approximately 1,500 ovaries that appeared normal: 3 dermoids, 1 Brenner tumor, 1 fibroma, 1 papillary cyst adenocarcinoma, and 1 granulosa cell tumor. Two of these tumors were discovered in the routine pathological examination of the ovaries removed at operation; 5 of them were found by examination of the ovaries during the operation. These small neoplasms ranged in size from a few millimeters to 1.5 cm.; none of the ovaries that harbored them were of more than normal size.

These tumors comprise a group of extreme interest in themselves, but a more important consideration lies in the practical aspect of the problem presented by their presence in apparently normal ovaries. Although they were mere infant growths when discovered, they would have enlarged eventually, but their early discovery and removal averted serious consequences.

The 7 cases are briefly discussed.

EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Da Silva Pereira, J. M.: Prolapse of the Urethra in the Female; Considerations Based on 3 Personal Observations (Prolapso de uretra femenina; considerações em torno de 3 casos). *Obst. gyn. lat. am.*, 1945, 3: 848.

The first of these 3 patients was a woman, 67 years of age, with senile involution of the sexual organs. First she had polyuria and later developed such dysuria as to make it necessary for her to urinate with great difficulty in a hot bath. Ten days before examination she noted a tumor of the vulva and began to pass blood with the urine. Examination disclosed an almond sized, cyanotic, bleeding mass at the external meatus of the urethra which had become strangulated at the base. Operation consisted in splitting the collarlike excresence on both sides down to the base, cutting away the upper flap, and suturing the remaining mucosa to the edge of the meatus with interrupted, fine, chromic catgut. The lower flap was also cut away and the incision extended back along the upper wall of the vagina, deep sutures being then applied, much as in the Hegar perineal repair, so as to produce a narrowing of the urethral lumen. An inlying catheter was kept in position for 5 days and this completed the treatment. A photograph, a month later, shows the condition still perfectly corrected.

The second patient was a child of 9 years, whose condition was discovered in the bath. The operation was the same as in the first instance, except that the lower flap was sutured in the same manner as the upper without an attempt at urethral repair. A half year later re-examination disclosed a perfect result.

The third case, that of a child of 10 years of age, was operated upon in the same manner as the second, except that the inlying catheter was omitted; nevertheless, the result was as good as in the other cases.

The author emphasizes the predominance of this lesion in the extremes of life and the good results to be expected by almost any of the methods of treatment previously proposed, provided that the condition be recognized early, before strangulation and infection render treatment difficult and dangerous.

The classification adopted by the author differs somewhat from those of previous writers on the sub-

ject; first degree prolapse is a prolapse of only a part of the circumference of the mucosa at the external meatus; second degree prolapse is a protrusion of the entire circumference of the anterior section of the urethral mucosa, and third degree prolapse is the protrusion of both the anterior and posterior segments of the mucosal cylinder lining the urethra.

JOHN W. BRENNAN, M.D.

Pérez, M. L., Arenas, N., and Bolla, I.: Immediate and Terminal Results of the Surgical Treatment of Genital Prolapse (Resultados inmediatos y alejados del tratamiento quirurgico del prolapso genital). *An. Inst. maternidad*, B. Air., 1944, 6: 9.

The authors report on 200 operations for genital prolapse performed in the gynecological section of the Institute for Maternity and Social Assistance in Buenos Aires from 1935 to 1943 inclusive. Seventy cases could be followed up to the present time and these are arranged in a table which makes up the greater part of the article. In all, the results were satisfactory, not a single instance of recurrence being observed.

Sixty-two of the 70 patients were under 60 years of age and in all of these the technique of Halban had been applied; the remaining 7 were more than 60 years old and in these the Le Fort technique had been done. In 7 patients in whom there was some loss of control of the urine a torsion operation on the urethra (2 instances), or the technique of Marion for narrowing the urethral lumen (5 cases) was added. In 1 senile patient the technique used was that of Kahr.

The technique of Halban was followed by preference under low spinal anesthesia with novocain, but occasionally local or general anesthesia was used. In cases of retroversion, the uterus was fixed to the highest part of the vesical peritoneum. Amputation of the cervix was done in 24 of the 70 patients, but only when the uterine cavity measured more than 8 cm. on hysterometry. Colpoperineorrhaphy with myorrhaphy of the puborectal muscle slips of the levator ani was performed in most cases; however, this was done only in the presence of a low rectocele with a bad perineal tear.

There was 1 case of death from pulmonary embolism. Three cases developed a postoperative vaginoperineal fistula and 1 case a rectoperineal fistula.

Several of the 200 patients are reported to have passed through a perfectly normal pregnancy, and in 1 of the 70 patients who were followed up a normal pregnancy and delivery was followed by a second pregnancy since the operation, without recurrence of the original condition. JOHN W. BRENNAN, M.D.

De Jaegher, M.: The Adrenogenital Syndrome of the Girl with Pseudohermaphroditism (Sur le syndrome adréno-génital de la fillette a forme de pseudo-hermaphroditisme). *Rev. belge sc. med.*, 1942, 14: 346.

The adrenal cortex exerts a decisive influence upon the harmonious development of the sexual morphology and physiology. This interrelation is also indicated by the names proposed for certain pathological states such as the "adrenogenital syndrome" and similar ones.

If the adrenocortical dysplasia develops in the first months of life, a pseudohermaphroditism results because of the appearance of secondary sexual characteristics from both sexes.

The appearance of an adrenogenital syndrome in the newborn, probably pre-existing during fetal life, affects the development in a much more profound and less reversible manner than the development of this syndrome during puberty or the menopause. Twenty-six cases of infantile adrenogenital syndrome have been reported, 21 of which occurred in girls.

The author reports a case in which the father of the girl had a history of active pulmonary tuberculosis. The girl developed normally up to the age of 15 months; at that time she showed a minimal amount of vaginal bleeding, which her mother considered a precocious menstruation. At the age of 18 months, hair appeared on the large labia, and the latter became hypertrophic at the age of 2 years. The voice turned harsh and a tendency toward masturbation was noted.

At the age of 3 years and 2 months the child was first examined and was found slightly overdeveloped in size (corresponding to 4 years), but with ossifications of the wrist bones, corresponding to age 12, no anomalies of the skull or sella turcica were found. The tuberculin test was positive. The girl was of dark complexion with slightly pigmented spots, dark hair, and bushy eyebrows. A light hair growth was seen on the upper lips, thighs, and calves. The chest was well developed, the pelvis appeared to be masculine, the legs were short with incomplete syndactylism of the second and third toes. The suprapubic region and the large labia were hairy. The large and small labia and the clitoris were hypertrophic with the external urethral opening on the undersurface of the clitoris. The vagina appeared to be of normal size. There was some mental retardation. A roentgenogram of the adrenal regions revealed a calcified tumor of the left adrenal gland. Laboratory findings including urine tests for male and female sex hormones revealed no abnormality.

A clinical diagnosis of calcified left adrenal tumor was made; 2 days after surgical extirpation of the tumor, the child died in shock. The autopsy revealed a recent caseous tuberculosis of the mesenteric ileocecal glands without a visible intestinal lesion and without a pulmonary lesion. The liver showed steatosis. The histological examination of the central nervous system and of the diencephalon was negative. The liver and spleen showed traces of a recent toxic infectious process. One kidney was larger with a normal arterial supply, the other, and smaller, kidney showed a discrete chronic pyelonephritis.

The thymus showed large Hassall bodies, and the thyroid gland showed colloid accumulation. The hypophysis showed a predominance of acidophil

cells. The ovaries appeared within normal limits with numerous follicles within the cortical zone and some graafian follicles in the central zone. There was no evidence of any stimulation of the ovaries by the adrenocortical tumor.

The left adrenal gland showed some toxic lesions, and the surgically removed right adrenocortical tumor revealed a microscopic picture which has been described by Goormaghtigh as typical for an adrenocortical tumor with masculinizing effects: (1) the presence of gross granulations arranged within the least atypical cells in halfmoons, which were stained by scarlet red, iron hematoxyline, and, at times, also by acid fuchsin; and (2) the gradual disappearance of the granulations into a marginal lacunar system.

Broster has classified the effects of tumors of the adrenal cortex according to the type of tumor, and the age and sex of the patients, as follows:

Androgenic tumors:

1. In the female child: masculine genital organs and pubertas praecox.
2. In the female at puberty: masculinization of the genital organs and suppression of ovarian function.
3. In the male child: pubertas praecox without spermatogenesis.
4. In the male at puberty, no effects being noticeable.

Estrogenic tumors:

1. In the male child: found to be an extremely rare occurrence.
2. In the male at puberty: feminization, gynecomastia, impotence, and testicular atrophy.
3. In the female child: pubertas praecox without maturation of the ovaries, but with menstruation in certain cases.
4. In the female at puberty: no discernible effects.

ARTHUR J. LESSER, M.D.

Jones, H. O., and Doyle, L. W.: Studies of Surgical Morbidity. Effect of Prostigmine on the Urinary Tract in Gynecologic Survey. *Am. J. Obst.*, 1946, 51: 184.

A study of the effect of prostigmine on the urinary tract following gynecologic surgery is presented. Eighty-five patients received the drug and 85 were used as controls. The incidence of postoperative urinary distress was the same in the treated as in the untreated group. The postoperative urinary findings were the same for both groups. The incidence of postoperative spontaneous voiding was the same in both groups.

"Gas pains" were somewhat lessened in the patients who received prostigmine, but in patients in whom obstruction existed, the discomfort was increased by prostigmine. The amount of "residual urine" was found to be the same in the patients who voided spontaneously as in those who had to be catheterized for urinary distress or distention. As used in the authors' study, prostigmine was ineffective in preventing postoperative urinary infections.

EDWARD L. CORNELL, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Trillat, P., and Notter, A.: Synostosis of the Pubic Symphysis. An Anatomic and Clinical Study (La synostose de la symphyse pubienne. Considérations anatomiques et cliniques). *Rev. fr. gyn. obst.*, 1945, 40: 321.

In studying a collection of 181 pelves at the Museum of the Obstetrical Clinic of Lyons, the authors observed a most peculiar anomaly in 1 pelvis, namely, a complete synostosis of the pubic bones. The specimen had been taken from a woman of 47 years and consisted of a symmetrical pelvis; the anteroexternal surface of the pubes and ischiopubic rami were very irregular and the internal margin bristled with exuberant exostoses. A veritable bony bridge connected the upper portion of the pubic bones. The superior synostosis was complete, which was confirmed roentgenologically, but a suture could be observed in the lower portion. Below the articulation, the ossified ends of the arch were plainly visible. The deformities along the margin of the hip bone and anterior surface of the pelvis resembled the lesions of rickets, but the more marked deformities in the inferior ischiopubic region suggested rather the inflammatory sequelae of osteomyelitis.

A search was made of the literature for cases of symphysiotomy in which such an anomaly might have prevented division of the symphysis. Some mention was found in the older literature of such instances, but emphasis was always placed on their extreme rarity. No mention of the condition was found in later literature. The incidence, according to clinical statistics, would be 13 in 670 patients. The authors examined specimens in other museums without success.

Just as the degree of ossification encountered in other articulations may vary, so the symphysis may display various degrees of ossification up to complete synostosis. Other possible etiological factors suggested include surgical injury, coxalgia, and acute osteomyelitic arthritis.

In a normal pelvis like the one described such a synostosis might cause no symptoms, and even labor might not be seriously affected. But in cases of constricted pelvis, such an anomaly would increase the dystocia. Synostosis constitutes a contraindication to symphysiotomy.

EDITH SCHANCHE MOORE.

NEWBORN

Baldi, E. M.: Hermorrhage of the Suprarenal Glands in the Newborn (Las hemorragias de las cápsulas suprarrenales en el recien nacido). *An. Inst. maternidad*, B. Air., 1944, 6: 159.

In 32 years of work at this institution, the author observed 10 infants with hemorrhage of the suprarenal glands. Four of the infants had been borne by primiparas (1 of these had had a previous abortion), and 6 had been borne by multiparas. At periods from a few hours to 11 days following delivery (spontaneous in 7; by forceps in 2; by Kristellar expression in 1) the infants developed symptoms of the "pseudopneumonia of the newborn" of Goldzieher and Gordon (*Endocrinology*, 1932, 16: 165), of icterus and progressive anemia, of cerebral hemorrhage, or of just plain collapse (with or without fever) and died in a few hours or in a few days. The autopsies disclosed little else than the hemorrhagic accident into the right, or into both (in 3 of the 10 cases) of the suprarenal glands.

These 10 not unusual reports of this condition are offered rather less with the thought of adding what is startlingly new to medical experience than to remind us of how little attention has been allotted to the problem of suprarenal hemorrhage, and of how much interesting work has been done, particularly in North America recently. Particular stress is laid on the report of Corcoran and Strauss (*J. Am. M. Ass.*, 1924, 82: 626), in which they stated that recognition of the condition at operation permitted ligation of bleeding artery and recovery of the child, and that the establishment of the clinical syndrome "pseudopneumonia in the newborn," will enable earlier recognition and proper treatment of the condition in many cases.

The author tends to blame this grave accident of the newborn child to a great extent on the innermost layers of the cortical layer of the suprarenal capsule, the so-called "fetal cortex," androgenic zone, or zone X, and particularly on the confused degenerative processes which occur at about the time of the child's birth.

The usual therapeutic procedures for individual manifestations are recommended, such as blood transfusions for anemia, 10 per cent glucose solution for hypoglycemia, and vitamin K for hypoprothrombinemia—low values of the coagulative essential are very apt to be encountered at birth. Although admitting lack of practical experience in the matter, the author believes that, despite some unfavorable reports, the newer and more efficacious preparations of the cortex of the suprarenal gland should be given an adequate trial. JOHN W. BRENNAN, M.D.

Mayes, H. W.: Cord Transfusions in Newborn Infants. *J. Pediat.*, S. Louis, 1946, 28: 69.

Following a long labor, difficult forceps delivery, or breech extraction, infants are frequently in severe shock. Not infrequently they are suffering from hemorrhage, and shock may not always be apparent at birth but develops shortly after. In premature babies the blood has a low content of vitamin K and prothrombin, and premature infants are much more subject to hemorrhage and will not withstand as

much trauma as full term infants. It would seem that if newborn full term infants following a difficult labor, and all premature infants were given some adult blood immediately following birth, such a transfusion might overcome shock, supply the needed vitamin K and prothrombin, and furnish nourishment and fully developed red corpuscles to be utilized in carrying on the circulatory functions.

Another hazard to the newborn infant is erythroblastosis. It would seem that the Rh factor alone does not determine or is not alone present in the development of the disease. Even more prognostic of its occurrence, particularly when found in infants of Rh-negative mothers, is a high count of normoblasts in the cord blood immediately or soon after birth. Transfusions would seem of value in the actual or prophylactic treatment of erythroblastosis.

Mother's blood is preferred for cord transfusion because at the time of delivery it contains more prothrombin and vitamin K than the average individual's, the vitamin K having been reinforced by administration during labor. If mother's blood is used only once, as is usually the case, it is not necessary to match the blood before giving the cord transfusion. Even if it is incompatible and although there may be some reaction, this one transfusion will assist the baby, since the blood will remain in the circulation long enough to exert its beneficial effect. The reason for this is the absence of agglutinins in the baby's blood at birth other than those derived from the mother.

The blood should be withdrawn before the birth under sterile precautions and placed on the delivery table. A 50 c.c. syringe containing sufficient citrate to insure against clotting in the syringe is used; 5 c.c. of a 2 per cent solution of sodium citrate is enough for 35 c.c. of blood. If 50 c.c. of blood are to be used, then 7 or 8 c.c. of the citrate are advisable. When the citrate is first drawn into the syringe, the entire length of the barrel should be moistened with it by withdrawing the plunger of the syringe and allowing the solution to come in contact with the entire inside of the barrel.

The amount of blood given depends upon the size of the baby and the reason for its use. The correct amount for a baby is about 10 c.c. per pound of body weight.

It is preferable to inject the blood before separating the baby from the mother. The baby is placed on the mother's abdomen or is held with the head down by an assistant. The cord is clamped and the blood injected into the umbilical vein. The cord should be steadied with the left hand, the barrel of the syringe grasped with the right, and the blood injected by making pressure on the plunger with the chest.

Great care should be taken after entering the cord vein. Should the point of the needle perforate the thin walled vein the blood will be injected into the substance of the cord, and a diffuse localized area of hemorrhage will appear. If this happens, the transfusion may be attempted again at a point nearer the baby's body, provided the first attempt was made far enough away from the navel. It is important to select the first site at a maximum distance, usually about 12 inches, to allow for subsequent trials. A large, short bevelled, Fordyce needle obviates the danger of vein injury.

At times it is advisable to separate the baby from the mother before undertaking the transfusion. The cord is likely to collapse when cut and the veins are hard to identify. If the cord is milked toward the clamp, enough blood can be collected to identify the vein.

The giving of blood seems to have no ill effect on the baby. Frequently the respirations are stimulated, and the baby, previously pale in color, becomes pink.

The first cord transfusion at the Methodist Hospital, Brooklyn, New York, was given in 1940 to a premature infant. The first report on cord transfusions was published in 1944 by the author.

A total of 281 cord transfusions were done from 1940 through March, 1945. One hundred and thirty-nine premature infants (37 weeks or under) received cord transfusions of their mother's blood, with 20 deaths; the majority of deaths occurred in infants of less than 7 months' gestation.

Forty-one babies were transfused following long labors or difficult deliveries with no deaths.

The babies of 110 Rh negative mothers received cord transfusions of their mother's blood. There were 2 deaths, both of premature infants.

A study was made of 601 cord smears; 288 contained no normoblasts, while 34 contained more than 15. Among these 34 infants there were 5 deaths and 1 stillbirth. Five of the 6 mothers were Rh positive; 1 was Rh negative. Of the 11 infants of Rh negative mothers in the group of 34, 9 received a cord transfusion, with 1 death, that of a premature infant.

A case is reported in which 90 c.c. of blood from the Rh negative mother of high titer (1:80) were given to her baby for marked jaundice with definite improvement in the baby's condition.

The author recommends cord transfusions to babies born of Rh negative mothers when the mothers have had a previous pregnancy. Use of mother's blood rather than donor's is contrary to the general rule, but so far the mother's blood seems to agree with the babies. Cord transfusions may be useful in anticipation of the development of erythroblastosis in infants of Rh negative mothers, or in its treatment when present at birth.

An addendum to the article states that there have been 117 additional cord transfusions between April 1 and December 1, 1945. Fifty-three of the transfusions were given to babies of Rh mothers, with mother's blood, making a total of 85 such transfusions this year with the loss of no viable babies from these mothers.

The total number of cord transfusions of mother's blood given to babies is 398. Two hundred and three of the babies were premature and 163 were babies of Rh mothers.

ERNEST E. ARNHEIM, M.D.

MISCELLANEOUS

Wislocki, G. B., and Dempsey, E. W.: Histochemical Age Changes in Normal and Pathological Placental Villi (Hydatidiform Mole, Eclampsia). *Endocrinology*, 1946, 38: 90.

Observations on the occurrence and significance of lipoids, glycogen, iron, alkaline phosphatase, and basophilia in the human placenta have been made previously by the authors. They now add further important cytological and histochemical data regarding not only normal but also certain pathological placentas.

The material used in this study consisted of 10 normal placentas ranging in age from 6 weeks up to term. In addition to these, 2 hydatidiform moles and the placentas from 2 cases diagnosed, respectively, as of severe pre-eclampsia and eclampsia were studied. The material was carefully analyzed, chemically and histologically, according to well recognized and accepted techniques. The results were correlated with previous observations.

The occurrence of acid phosphatase in the placenta is reported here for the first time. It accumulates in the trophoblastic syncytium of the human placenta toward the very end of gestation. It occurs principally in the nuclei of the syncytium and to a lesser extent in the perinuclear cytoplasm. Alkaline phosphatase begins to appear in the syncytium in the first months of pregnancy and increases steadily until term. Thus these two enzymes characterize the ageing placenta; they occur in inverse proportion to cytoplasmic basophilic substance (ribonucleoprotein), which diminishes steadily as the placenta ages.

Iron and calcium are demonstrable in considerable quantities in the first half of gestation in the stroma of the chorionic villi, where they are mainly deposited just beneath the trophoblastic epithelium. In the same localities and during the same period traces of acid and alkaline phosphatase are also encountered.

In the hydatidiform moles no acid phosphatase and relatively little alkaline phosphatase were found. There was definite histochemical confirmation of the known fact that the syncytium produces steroid hormones. No calcium and only diffuse traces of iron were demonstrable in the villi of the moles, but glycogen was present in both the cytotrophoblast and syncytium in amounts greatly increased over normal. The increases or decreases of these various substances in contrast to the amount of these substances in normal villi are referable to the absence of the fetal circulation and a diminished maternal circulation.

The 2 placentas from the cases of severe pre-eclampsia and of eclampsia were unusual. Both cases were atypical in so far as in each the condition was present at 4½ months of gestation. The chorionic villi were prematurely aged as judged by their cytological and histochemical appearance. Many of the villi showed premature ageing of the syncytium, while a few of the very smallest terminal villi showed complete necrosis of both the stroma and syncytium. Ribonucleoproteins (cytoplasmic basophilia) were prematurely reduced, whereas alkaline and acid phosphatases were appreciably increased. There were also noticeable changes in the amount and distribution of both calcium and glycogen. The decrease in cytoplasmic basophilia associated with a premature increase in phosphatase suggests a possible disturbance of nucleoprotein metabolism in this disease.

L. James Talbot, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Reiselman, S. D.: Early Amyloid Nephrosis following Compound Bone Injuries. *Vrachebnoe Delo*, 1945, p. 71.

As a rule, amyloid nephrosis is closely related to chronic diseases causing cachexia, especially pulmonary, osseous, or articular tuberculosis, and prolonged suppurative processes such as empyema, bronchiectasis, pulmonary abscess, and osteomyelitis. However, amyloid nephrosis may develop following processes of short duration. This observation is not only of diagnostic but also of great prognostic value because, in spite of the fact that the primary process may subside, amyloidosis may be responsible for a fatal outcome. The condition can be easily mistaken for a decompensated heart or chronic nephritis and incorrect treatment instituted. On the other hand, early recognition of the pathological process and an attempt to eliminate the primary pathogenic source of the disease may be followed by complete recovery.

The author stresses the fact that albuminuria accompanying amyloid nephrosis is not pronounced, but it is subject to considerable fluctuations. The urinary sediment is poor in formed elements when compared with the same degree of albuminuria in other renal conditions. Edemas are not very pronounced and are more marked in the lower than in the upper extremities. Ascites is infrequent and hydrothorax rare.

When amyloid nephrosis is accompanied by amyloidosis of the intestines, diarrhea appears and the condition may then simulate enterocolitis, avitaminosis, or dysentery.

The author maintains that amyloid nephrosis is much more frequent following compound fracture than is generally assumed. He describes 28 cases in which the complication developed from 2 weeks to 3 months after a compound fracture with osteomyelitis. It would be difficult to believe that all 28 patients had had the amyloid nephrosis before the injury and that none of them had clinical symptoms before the trauma. JOSEPH K. NARAT, M.D.

Fort, A.: Tumors of the Renal Pelvis (Tumores de la pelvis renal). *Rev. med. Rosario*, 1945, 35: 1213.

Tumors of the pelvis of the kidney are being reported much more frequently of late years, perhaps because of the better methods of diagnosis for this condition, developed by urologists. However, these tumors are still rather rare, even in comparison with the tumors of the body of the kidney itself. The author's material comprises only 4 cases in comparison with 14 cases of tumor of the kidney parenchyma.

The author classifies tumors of the renal pelvis in general by more or less combining the classifications of Albarrán and Imbert, Marión, and Ewing as follows: epithelial and conjunctival tumors. The conjunctival forms comprising sarcoma, leiomyoma, and angiosarcoma are here ignored, but the epithelial forms are further classified into papillary and nonpapillary types. The papillary types are then subdivided into benign papillomas and papillary carcinomas, and the nonpapillary or solid types are subdivided into paramalphigian epitheliomas and epidermoid or cornified epitheliomas. The hardest to distinguish clinically are the two papillary types, the one benign, the other highly malignant; however, in operable cases the treatment is the same —nephrectomy with removal of the entire ureter because of the frequency of implantation into the lower segments of the urinary tract. In the cases of the solid tumors the operation may be limited to the kidney and that part of the upper ureter which is obviously involved. For the nephroureterectomy the author prefers the two stage operation.

In the first of the 4 cases here reported the tumor proved to be of a mixed type, a cornified, or pavement cell, epithelioma which diffusely invaded the kidney parenchyma and the perinephric fatty capsule, and scattered fields of a hypernephroid type of large clear cell. However, both types had given rise to more distant metastases, which had retained the identity of the original tumor.

The second tumor was an infiltrating, i.e., a solid, nonpapillomatous epithelioma made up of cells of polymorphous character; however, some areas evidenced a typical malphigian architecture, and the final diagnosis was that of an infiltrating epithelioma of the excretory passages made up of malphigian or atypical cells.

The third tumor, on ascending pyelography, suggested the possibility of a papillary character; however, on operation it proved to be a solidly infiltrating mass, occupying and replacing the entire lower pole of the kidney, and metastasising in solid masses down the ureter into the perirenal fatty capsule and, in places, throughout the rest of the kidney parenchyma. The tumor cells were highly polymorphic and the presence of polynuclear giant cells rendered the interpretation difficult. At some points the neoplastic tissue had given rise to pseudoglandular structures with a papillary disposition of the tumor capsule. The final diagnosis was atypical and pseudoglandular epithelioma of the excretory passages.

The fourth patient exhibited clinical (cough, hemoptysis) and x-ray evidence of pulmonary metastasis and was not subjected to operation.

All of these patients were more than 40 years of age. All had one or more of the usual findings for this condition: pain and tenderness over the involved kidney, hematuria on that side, a depressed contrast urogram and excretion of indigo-carmine (chromo-

cystoscopy), and distortion of the ascending pyelographic image, including the already cited instance in which the confused shadow tones and dentate edges suggested the presence of a papillomatous condition. In no instance did the removed kidney exhibit noteworthy distortion of contour. In not one case did the patient live even 4 months following the operation because of pulmonary or generalized metastases. JOHN W. BRENNAN, M.D.

Hamm F. C.: Angioma of the Kidney. *J. Urol.*, Balt., 1946, 55: 143.

The patient was a 34 year old infantry rifleman who had been in the service ½ year. He was somewhat "under par" as a result of the severe climatic conditions. His complaints were pain in the back, particularly in the left renal area with typical distribution, radiation anteriorly and downward toward the left testicle. Gross hematuria was observed. The blood was mixed with the urine; it was bright red in color and contained many small clots. No dysuria or frequency was observed, but the record showed that the patient had a temperature of 102 degrees, which responded promptly to the administration of sulfadiazine.

Physical examination revealed a chronically ill male with a sallow color. However, the examination, including abdominal palpation, was otherwise negative.

At cystoscopy bloody spurts of urine were observed coming from the left ureteral meatus. Upon catheterization of the ureters clear urine was obtained from the right kidney, but bloody urine from the left. In the retrograde pyelograms the right kidney was found to be considerably smaller than the left, and, in general, poorly developed. There was also some dilatation of the lower right ureter which suggested the possibility of a previous infection.

The left kidney appeared to be normal in size; if anything, it was slightly larger than normal, but in the upper calyx a small filling defect was observed.

It seemed evident that the lesion was an early neoplasm arising from the epithelium of the renal pelvis, and that under ordinary circumstances this would have been sufficient indication for removing the left kidney and possibly the ureter, but because of the doubtful ability of the right kidney to sustain life, a resection of the upper pole of the left kidney was done.

The specimen consisted of the upper pole of the left kidney, weighing 38 gm. and measuring 16.5 by 3 by 4 cm. The specimen was bisected, which exposed the pelvis and calyces. The usual renal architecture stood out prominently. Immediately contiguous to a papilla of a posterior, superior calyx and apparently arising directly from the pelvic mucosa a small tumor mass measuring about 4 mm. in diameter was found attached to the pelvic mucosa by a broad pedicle.

The mass was dark in color and rough on its superior surface. It was in contact with the surrounding pelvic mucosa, which was somewhat granular, thickened, and of dusky hue. The remaining portions of the pelvic lining revealed no notable alterations, the surface being smooth and pale.

On microscopic examination the tumor appeared as a polypoid mass, the superficial epithelium of which was largely absent and was replaced by a leucocytohemorrhagic exudate in a moderately advanced stage of organization. The pedicle and inferior portion of the mass were covered with transitional epithelium which was continuous with the pelvic epithelium. The stroma was generally dense and fibrous and in places was infiltrated with polymorphonuclear leucocytes including eosinophils. The greater portion of the stroma consisted of widely ectatic vessels resembling a cavernoma.

Many of these vessels were thick walled and fibrous with an endothelial lining. Portions of septa were seen which extended into the lumen as in a cavernomatous mass. Other portions were seen in which the stroma contained an engorged, small, thin walled capillary net. Enlarged dilated vessels were present in the tip of the papilla.

JOHN A. LOEF, M.D.

Squire, F. H., and Kretschmer, H. L.: A Study of the Ureters in Bladder Neck Obstructions. *Radiology*, 1946, 46: 32.

This is a preliminary report dealing with the course of the lower ureters in bladder neck obstruction as observed in intravenous urography. The study is based on a review of 120 films selected at random from the Roentgen Ray Department of the Presbyterian Hospital of Chicago. Since the lower ureters often are not visualized, a rather large number of films had to be examined to find 120 in which their visualization was present.

A normal course of the lower ureters was found in 53 cases (44.16%), 48 (90.56%) of which presented benign obstruction and 5 (9.43%) carcinoma.

In 67 cases (55.82%) the lower ureters had an abnormal course. Of this number, 60 (87.55%) presented benign obstruction and 7 (10.44%) carcinoma.

The following abnormalities were observed:

Right angle turn of the ureter	25
Right angle turn of the ureter (high)	4
Lateral displacement of the ureter	
Marked	7
Slight	2
Looping of the ureter	12
High entrance of the ureter into bladder	4
Low entrance of the ureter into bladder	2
Entrance of the ureter at midline	2
Dilatation of the ureter	
Marked	13
Slight	11
Tortuous ureter	3
Hydronephrosis	6
Normal course of ureter with dilatation	8
Normal entrance of the ureter with lateral displacement	4

T. LEUCUTIA, M.D.

BLADDER, URETHRA, AND PENIS

Coutts, W. E., and Vargas-Zalazar, R.: Contribution to the Etiology of Acquired Fibrosis of the Bladder Neck. *Brit. J. Urol.*, 1945, 17: 136.

The authors state that fibrosis of the vesical neck is characterized by the proliferation of fibrous tissue in the submucosa and into the muscle fibers of the internal sphincter. The entire circumference of the neck of the bladder may be transformed into fibrous tissue, producing a contracture of this structure or only of its inferior portion, sometimes as far back as the trigone; thus a median bar is produced. The disease is congenital or acquired. The acquired form is much more common in adults and is usually confined to the posterior region of the vesical sphincter and trigone. It may arise from trauma, chronic infections of the posterior urethra and prostate, and, in women, from vaginal cervical parametria or perirectal tissues. It is believed that acquired fibrosis is a first stage of submucous and muscle-layer invasion by an infecting agent, and that the virus of lymphogranuloma venereum is the cause in many cases.

Panendoscopy and cystourethrograms are of value in the diagnosis. In the cystogram, the image is similar to that seen in suprapubic prostatectomy.

The authors report 3 cases in which lymphogranuloma virus macroforms in extracytoplasmic plaques were found in tissue removed from the bladder neck with a resectoscope. In their opinion the pathogenic agent invades the bladder neck tissues along the mucous and submucous lymphatics and, based on clinical, laboratory, and histoviral findings, lymphogranuloma venereum virus is a frequent cause of partial or total acquired fibrosis of the bladder neck.

DAVID ROSENBLOOM, M.D.

Cristol, D. S., and Broders, A. C.: Malacoplakia of the Bladder. *J. Urol.*, Balt., 1946, 55: 260.

The cause of malacoplakia of the bladder is unknown. A careful search for acid-fast organisms in the specimens of bladder removed for biopsy in the 2 cases reported by the authors gave negative results. No clinical evidence of tuberculous infection could be found in these cases. Escherichia coli was cultured from the urine of both patients.

Grossly or cystoscopically the characteristic lesions appear as plaques which vary in number, size, and distribution. The edges of the plaques appear to be abrupt or slightly overhanging. Very often a zone of hyperemia surrounds these lesions. The centers of the large plaques often appear depressed or umbilicated. Frequently, the epithelium appears to be ulcerated over the center of the lesion.

The principal cellular elements are large oval or polyhedral cells, frequently closely aggregated and found in the submucosa. These cells vary in size, but generally are at least as large as a hepatic cell. They have a well defined cell membrane and are for the most part mononucleated. Often the nucleus has disappeared or its presence is marked by the so-called cell inclusions. While the cytoplasm appears vacuolated in places, it is most characteristically granular. Within the cytoplasm of many of these cells, as well as between many of the cells, can be seen the Michaelis-Gutmann bodies or "inclusion bodies." These vary in size, shape, and number. In size they range from 1 or 2 microns up to bodies so large as to occupy the entire cell. They have a strong affinity for hematoxylin, which stains them purplish. For the most part, they are homogeneous and highly refractile. The smaller forms are round or oval but the larger forms show fine crenations or irregularities. Many of them show a definite concentric lamination suggesting corpora amylacea. When stained with the Kossa stain they reveal a high calcium content.

The majority of the patients are women more than 30 years of age who give histories of having suffered frequent bouts of cystitis. However, all age extremes in both sexes have been described.

Urinary frequency and gross hematuria are the most prominent symptoms. The diagnosis rests on the finding of the characteristic lesions and the removal of a portion of the diseased tissue for microscopic examination. The microscopic picture, as previously described, establishes the diagnosis.

The cases of malacoplakia so far reported are too few for the treatment to be standardized. The authors agree with Blum, Folsom and Dickson, Gray and Kidd, in reporting fairly good results following fulguration.

Cordonnier, J. J.: Fistula of the Penile Urethra. *J. Urol.*, Balt., 1946, 55: 278.

The subject of fistula of the penile urethra has assumed added importance since the advent of the present war. Plastic repair of this condition has always presented considerable difficulty, and numerous plastic procedures have been recommended for the purpose of repairing this defect. Although stainless steel "pull out" sutures have been widely used in other locations, no mention of their use in this connection has been found in the literature. A series of 3 cases is presented for consideration. Good results were obtained in all of these cases, with prompt healing of the operative wounds, without infection, and it is believed that the method described is superior to the methods previously presented.

The use of sulfadiazine and penicillin in combination, both preoperatively and postoperatively, has undoubtedly played a very important role in the successful conclusion of these cases. Infection has always been the principal problem in a repair of this nature and, by the use of these two drugs in combination, is practically eliminated. All 3 cases healed without any signs of wound infection.

Diversion of the urinary stream is an essential step prior to operation. It is believed that a suprapubic cystostomy is preferable to perineal urethrostomy. The presence of repeated nocturnal erections, which seemed to be due to irritation of the posterior urethra by the catheter, presented a definite hazard to the success of both operations when an external

urethrostomy had been done. Although urethrostomy is a much simpler technical procedure, the additional operative work required by cystostomy is warranted for this reason alone. Drainage of the bladder by urethral catheter, with the inevitable accompanying urethral infection, is contraindicated.

It is believed that simplicity of procedure is an important factor in any plastic procedure for the repair of urethral fistula. The use of scrotal flaps, skin grafts, and other complicated procedures are generally unnecessary, and only serve to add additional hazards to obtaining a successful result. A careful elevation of the skin flaps around the incision will ordinarily allow closure of the wound without tension.

Careful handling of tissue is undoubtedly important in any plastic repair of this nature. To minimize trauma, small hooks are used throughout, instead of thumb forceps. Plain catgut (0000) on an atraumatic needle is used for all sutures except the skin. The use of the No. 36 stainless steel wire "pull out" suture is probably the most important single step in bringing about a successful closure. It permits the use of finer catgut than would be possible otherwise. The advantage of fine catgut in a potentially infected area is self evident. In addition, all tension is removed from the suture lines.

The use of a pressure dressing to prevent the formation of hematoma under the elevated skin flaps is advisable in certain cases. Meticulous wound care must be observed at all times. The topical use of 1:500 penicillin as a urethral instillation has been of value. Periodic urethral dilatations must be maintained for a period of time to prevent stricture formation.

A method of repair utilizing stainless steel "pull out" sutures is described. The procedures outlined are simple to perform. Postoperative convalescence is short and the results have been excellent.

JOHN E. KIRKPATRICK, M.D.

GENITAL ORGANS

Borthwick, W. M.: The Pathogenesis of Tuberculous Epididymitis. *Edinburgh M. J.*, 1946, 53: 55.

Borthwick studied the pathogenesis of tuberculous epididymitis by examining the records of 5,476 tuberculous males admitted to the hospital during a period of 21 years, and 402 (7.3%) had involvement of the epididymis by tuberculosis. The corrected true incidence is probably 4.5 per cent. The youngest patient was 8 months old and the oldest was 63 years old.

Male genital tuberculosis occurs most commonly during the years of maximal sexual activity. In 88.3 per cent of the patients at least one extragenital tuberculous lesion was proved. Injury appears to have little influence in the production or localization of the genital disease. Gonococcal epididymitis had little or no influence on the occurrence of tuberculous epididymitis. The lesion was unilateral in 43.5 per cent of the patients and bilateral in 56.5 per cent. Recurrence occurred within 1 year in 74.6 per cent, and in 58.7 per cent the disease became bilateral within 6 months. Negative rectal findings were present in 12.7 per cent. The remainder (87.3%) were "rectal positive." The author received the impression that, no matter how early the tuberculous epididymitis, a lesion of the pelvic genitalia could be felt rectally in the great majority of patients, and that vesiculitis or prostatitis, or both, precedes the more peripheral genital lesion.

Renal tuberculosis also was present in 34.8 per cent of the patients. Men with epididymal tuberculosis in whom tubercle bacilli cannot be isolated from the kidney urine are extremely few in number. The author believes that renal tuberculosis precedes epididymal tuberculosis in the great majority of cases. Tuberculous prostatitis and vesiculitis precede epididymitis; the globus minor is the first part to be affected, and in testicular disease the maximum involvement was at the mediastinum testis.

The author is satisfied that the sequence of events in genitourinary tuberculosis is from the kidney to the pelvic genitalia and from there to the epididymis. The spread of tuberculosis to the epididymis takes place in the majority of cases by the lumen of the vas deferens. The great majority of patients with tuberculous epididymitis have or have had a tuberculous bacilluria from a clinical or subclinical lesion of the kidney. In almost every case of tuberculous epididymitis in the present series, with or without urological symptoms, tubercle bacilli have been isolated from the kidney urine. Infection of the prostate and seminal vesicles probably takes place by urine transmission, by heavy work, straining, and the very act of micturition. DAVID ROSENBLOOM, M.D.

Mansfield, O. T.: Spontaneous Gangrene of the Scrotum (Fournier's Gangrene). *Brit. J. Surg.*, 1946, 33: 275.

Mansfield reports a case of spontaneous gangrene of the scrotum in a man 43 years of age who was admitted to the hospital with an entirely gangrenous scrotum. This was removed, except for 3 triangular flaps at the base which seemed to retain viability. Two of these were based laterally and 1 posteriorly, and between them both testes lay completely exposed. Section of the removed tissue showed marked interstitial edema with many thrombosed vessels. The patient's condition rapidly improved after operation, and epithelization was complete in 6 weeks.

Fournier first described the condition in 1844, noting the explosive onset in a healthy man, the rapid progress of the gangrene, and the total absence of the usual causes for gangrene. Further reports in the literature describe the extensive and fairly constant area of gangrene with integrity of the testes and inguinal and anal regions, rapid resolution of the adjoining cellulitis, and a tendency for spontaneous repair.

The author believes that the condition is a vascular disaster of infective origin analogous to cavernous sinus thrombosis. The fairly constant pattern of the

sloughing area is adequately explained on a vascular basis which would account for the existence of the described flaps. The latter are supplied by the external pudendal branch of the femoral artery and superficial perineal arteries. The rapid gangrene is comparable to that of a flap of skin which has become infected and its limited vascular supply destroyed by thrombosis. Therefore, treatment should consist of radical removal of all sloughing areas, sulfonamides, and penicillin. Repair seems unnecessary. Reports in the literature indicate that death in most instances has been due to toxemia. The bacteriological agents have been streptococci, staphylococci, or both.

DAVID ROSENBLOOM, M.D.

Bertelsen, A., and Wandall, H. H.: Vasoseminal Vesiculography and Its Clinical Application. *Acta radiol.*, Stockh., 1945, 26: 36.

Following a brief résumé of the literature on vesiculography, the authors report 16 of their own cases in addition to some work on rabbits to show the irritative effects of hippodin (a 50 per cent solution of sodium orthoiodine hippurate) as compared to the innocuous preparation, perabrodil (3-5-diiodide-4-pyridon-N-diethyl-amine acetate).

The experimental work showing the irritative qualities of hippodin was done on the vasa of rabbits which were injected close to the testicle and sections of the vasa were removed at 2, 4, 10, 14, and 21 day intervals for microscopic study. On the second day the vasa injected with hippodin showed round cell infiltration, especially eosinophilia in the wall of the vas, whereas the epithelium of the vas was well preserved everywhere. The specimens of the fourth day showed complete epithelial desquamation and slight submucosal fibrosis, and by the fourteenth day there were no pathological changes. On the other hand, the rabbit vasa injected with perabrodil showed no changes at anytime from 2 to 28 days after injection.

Of the 16 patients subjected to vesiculography, 6 were examined at vasectomy and 10 were examined for diagnosis of genital diseases. The conditions found were as follows:

Aspermia (1); oligospermia (1); groin and testicular pain following herniotomy (2) 4
Aspermia following testicular trauma 1
Sequel of epididymal resection 1
Undescended testicle 2
Vesiculitis 2

In 3 cases of herniotomy by the Bassini method there was obstruction to the vas where it entered the inguinal canal. In the 2 patients with undescended testicles the vas was extraordinarily tortuous, but no variation in vasal caliber was evident. In the 2 instances of operatively proved seminal vesiculitis there was no evidence of dilatation of the canals nor retention of the contrast media. In 3 instances (1 with undescended testes, 1 with trauma to the testicle, and 1 with an epididymectomy with an infection) there was demonstrated an insufficient development of the seminal vesicles and this the authors explained on the basis of disuse.

In the opinion of the authors, the use of vesiculography for diagnostic purposes is warranted by the following:

1. Aspermia in the presence of preserved testicular function.
2. Seminal vesiculitis
3. Adults (not children) about to have an orchidopexy to reveal the presence of sufficient length of the vas deferens
4. Patients with groin or testicular pain following herniotomy with the vesiculogram demonstrating the presence or absence of constriction of the vas at the operative site.

ROBERT LICH, JR., M.D.

MISCELLANEOUS

Moore, T.: True Infective Abacterial Pyuria. *Brit. J. Urol.*, 1945, 17: 131.

The author describes "true infective abacterial pyuria," a syndrome which has been experimentally transmitted to animals and apparently caused by a virus infection. The mucosa of the posterior urethra, bladder, or upper urinary tract is affected. The infection resists all forms of treatment except intravenous arsenobenzole drugs. In the renal pelvis the mucosa is thickened and edematous; it shows varying degrees of erythema, and flakes of lymph adhere to it. The submucosa is infiltrated with mononuclear cells, sometimes aggregated into follicles. No organisms are seen. There is no disease of the renal substance. The onset is acute or gradual. There is frequency, dysuria, and sometimes hematuria, with little or no disturbance of the general health. The urine contains many leucocytes, but microscopic examination and culture fail to demonstrate organisms.

Intravenous urography shows some dilatation of the pelvis and ureter, and sometimes small filling defects due to follicular pyelitis and ureteritis. Cystography shows a tiny contracted bladder with an irregular outline. Cystoscopy shows generalized severe nonspecific inflammatory changes, with none of the characteristic appearances of urinary tuberculosis. Tubercle bacilli are never found. There are no constitutional changes, no loss of weight, and no urographic evidence of renal damage. In doubtful cases the therapeutic test is of value.

The course of abacterial pyuria is prolonged and the bladder capacity becomes progressively reduced. The administration of an organic arsenic preparation, such as novarsenobenzole, causes rapid improvement and cure. The author usually administers .3 grams intravenously at intervals of from 5 to 7 days. Normally, four doses are sufficient. A case report is given.

DAVID ROSENBLOOM, M.D.

Flocks, R. H.: "Early" Calcium Urolithiasis. *J. Am. M. Ass.*, 1946, 130: 913.

It has been shown that calcium urolithiasis is likely to occur in conditions in which immobilization of the individual is present, in which portions of the

TABLE I.—PREVENTIVE TREATMENT OF CALCIUM PHOSPHATE UROLITHIASIS IN PATIENTS WHO ARE EXTENSIVELY IMMOBILIZED OVER LONG PERIODS OF TIME

Measures	Accomplishes	Comment
1. Maintenance of large fluid output	a. Counteracts stasis by producing a steady flow of urine b. Diluted calcium concentration especially important during period of hypercalcinuria (first 6 to 12 weeks of immobilization) c. Minimized likelihood of infection d. Washes out debris and small calcium precipitates	a. Measure intake and output carefully; remember in cases of neurologic involvement that residual urine may cause inaccuracy in output measurement
2. Control of diet High vitamin A and B acid ash diet usually used	a. High vitamin A and B improve epithelial nutrition b. Increase acidity of urine; calcium phosphate is more soluble in an acid than in an alkaline urine	a. Check urinary *p*H daily with nitrazine paper b. Discontinue acid ash diet if urine remains alkaline from any cause such as infection with urea-splitting organisms
3. Control of stasis a. Movement of patient b. Provision of adequate drainage by catheter or surgery if necessary c. Maintenance of a large fluid output	a. Makes sure that no portion of urinary tract is dependent or undrained for too long a time b. Minimizes infection c. The use of a catheter makes possible irrigation of pelvis or ureter with special solutions such as citric acid and malic acid solutions	
4. Control of infection a. Maintenance of large fluid output b. Adequate drainage c. Chemotherapy: 1. Sulfacetimide 4 gm. daily in drug of choice 2. Sodium sulfathiazole 4 gm. daily 3. Other sulfonamide 4. Neoarsphenamine 0.3 gm. two times weekly in some staphylococci infections 5. Penicillin, very useful	a. Decreases particles in urine (pus and epithelial débris, which may act as nuclei for stone formation) b. Infection with urea-splitting organism produces alkaline urine, which causes precipitation of calcium phosphate	a. Watch urine *p*H with nitrazine paper b. Study centrifuged urine specimen daily for pus cells
5. Continuation of treatment for 3 months after immobilization has ceased	To remove any small precipitation which may have formed during period of stasis and hypercalcinuria	
6. Frequent radiographic check-up examinations during illness and every 3 months for one year after immobilization has ceased	This is very important; small precipitates may not be visualized in early urograms but may be visualized later after they have grown; many stones (especially in patients with neurologic lesions) may be silent for years and thus produce irreparable damage unless they are visualized by x-ray examination and treatment instituted	

Note: Henline has shown that the emptying time of the renal pelvis is greatly increased by a small urinary output and decreased by a large fluid output (Lowsley and Kirwin: Clinical Urology).

urinary tract are paralyzed, and in which obstructions and infections of the urinary tract occur, or in which pronounced dehydration is present. There are three probable mechanisms involved in the formation of stone in these situations: infection, stasis, and hypercalcinuria. Multiple small precipitates of calcium phosphate are present in the calices and pelvis of the kidney. These small stones may all pass; they may fuse to form larger stones, or may act as the nucleus for larger stones; and they may be silent for long periods of time, during which considerable damage to the urinary tract occurs. In the first 6 or 8 months after the onset of the predisposing conditions, before the stones have become intimately mixed with organic material and definitely solidified, the situation may be called "early" calcium urolithiasis. Because this condition is frequently silent, repeated roentgen examinations are necessary.

TABLE II.—CONDITIONS PREDISPOSING TO CALCIUM PHOSPHATE UROLITHIASIS

1. Disease producing prolonged immobilization of the body:
   a. Fractures of the spine or extremities associated with prolonged immobilization of large bones.
   b. Chronic osteomyelitis
   c. Chronic arthritis or other bone joint disease producing immobilization of large portions of the skeleton
   d. Neurologic damage as a result of trauma or disease producing prolonged immobilization
   e. Chronic visceral disease requiring prolonged recumbency
2. Changes in the urinary organs:
   a. Congenital anomalies associated with stasis
   b. Acquired obstruction—stricture of urethra and the like
   c. Paralysis of urinary passageway
   d. Introduction of infection into urinary tract
   e. Foreign body in urinary passageway
3. Endocrinopathies:
   a. Hyperparathyroidism
   b. Hyperthyroidism?
   c. Hyperpituitary disease?
4. Focus of infection elsewhere in the body?
5. Vitamin deficiency or excess
   a. Vitamin A deficiency?
   b. Vitamin D excess
6. Metabolic abnormalities
   a. Idiopathic hypercalcinuria
   b. Changes in colloids?

Note: Conditions with question mark are put in mainly on a theoretical basis. Others are put in on the clinical basis.

Special types of treatment are necessary because of the peculiar character of these stones. Later symptoms may be hematuria, ureteral colic, infection (due to stone obstruction) resulting in pyuria, chills, fever, leucocytosis, and renal pain.

When infection is not present and no renal damage has yet occurred ("early phase"), the stone is ideal for dissolution by means of a combination of fluids, diet, and irrigation therapy. When infection commences, the stones grow more rapidly, calcium phosphate precipitates in the tubules, and the tips of the pyramids become ulcerated and sometimes calcified. If adequate drainage cannot be instituted by ureteral catheter, open surgery must be done. In addition, supportive treatment, chemotherapy, and irrigation should be carried out. In chronic cases the kidney pelvis and calices become distorted from infection, which results in a disturbance of peristalsis, poor drainage, and ready recurrence.

When a case is seen early, there is a typical irregular opacity suggesting depositions of calcium salts usually around the pyramids in the calices. When severe infection is present, there is evidence of consolidation of the calcium particles into definite stones, and dilatation of the kidney pelvis, infection, and obstruction. In late cases the stone shadows are much more dense, there are extensive changes in the calices, kidney pelvis, and kidney, and the condition has passed to the state of late calcium urolithiasis.

With regard to treatment, the author staes that because the stone in early calcium urolithiasis is soft and mushy, surgical measures usually fail. If consolidation has not occurred, irrigation therapy through a ureteral catheter, double ureteral catheter, nephrostomy or pyelostomy tube, with acetic acid solutions, citrate solutions, citrate solutions with magnesium oxide, malic acid solutions, and solutions containing proteolytic enzymes, will usually break up the particles and cause them to pass. Infection is controlled by sulfathiazole, penicillin, fluids, and adequate drainage. Open operation is contraindicated in early calcium urolithiasis, until irrigation treatment has been given a thorough trial; and, if open operation is performed, postoperative irrigation through a pyelostomy or nephrostomy tube is of value.

DAVID ROSENBLOOM, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Chrom, S. A.: On the Incidence of Osteochondrosis. *Acta radiol.*, Stockh., 1945, 26: 49.

In cases of osteochondrosis the roentgen examination of the lumbar spine shows a characteristic narrowing of some intervertebral disc, most often the 5th lumbar. It is accompanied by osseous changes in the form of sclerosis of the borders of the vertebral bodies involved and typical exostosis formation on the anterior border of one or both of these bodies. In some cases this finding is complicated by a displacement of the two bodies in relation to each other, which gives the appearance of spondylolisthesis. These changes are typical of osteochondrosis.

The process begins with a diminution of the fluid content of the nucleus pulposis, and later the x-ray shows cracks and fissures running in all directions. As the process progresses the nucleus shrinks and the size of the disc diminishes. The annular fibrous ring remains intact, although the fibers of the ring become slack, and thus the possibility arises for the vertebral bodies to become slightly dislocated in relation to each other. To the continuous small traumas to which their surfaces thereby become exposed, they react by sclerosis. All of the secondary changes here described may not be found in all cases. A diminished disc as the only finding is of no value whatever, especially in the case of the 5th lumbar disc, because normal variations in the shape and position of the 5th lumbar vertebra vary considerably. In young individuals spondylosis deformans may be present. This disease shows degeneration in the peripheral part of the disc and the fibers of the annular ring. The fibers break, the disc bulges outward, and there is pressure on the anterior longitudinal ligament. A beakshaped exostosis develops, distinguished from the exostosis which develops in uncomplicated cases of osteochondrosis. The differential diagnosis rests between acute and chronic inflammations and malignant tumors, but in these cases there is a marked thinning of the bone due to the loss of calcium salts.

One hundred and thirty-two patients were used for this study. In 20 of the cases there was a characteristic picture of osteochondrosis. In 18 of the 20 cases the location of the lesion was in the 5th lumbar disc; 11 of the 20 patients were men. Twelve of the 20 patients were between 40 and 59 years of age. Fifteen of the 20 had been admitted to medical services for various reasons. One often sees marked spondylosis deformans associated with very few symptoms. A control group of 63 patients was studied. Two of these patients showed typical findings of osteochondrosis. In patients with complaints referable to the vertebral column, frequency of osteochondrosis is ten times greater than in the controls.

The characteristic roentgenological changes in cases of osteochondrosis were: (1) narrowing of the disc and marginal sclerosis in all 22 cases; (2) liplike marginal exostosis in 19 cases; and (3) displacement of the bodies of the vertebrae in relation to each other in 6 cases. In 4 of the 6 cases of displacement, the body of the upper vertebra had slid forward, and in the 2 others it had become displaced backward. In these 6 cases the other three characteristics were present. Air myelography was done in 7 of the 20 cases in which there was osteochondrosis. In all 7 cases the findings were positive, and in 6 of the 7 cases the findings were verified at operation. Only by air myelography is it possible to ascertain whether a prolapse of the nucleus exists.

RICHARD J. BENNETT, JR., M.D.

Einarsson, F.: On the Treatment of Dupuytren's Contracture. *Acta chir. scand.*, 1946, 93: 1.

The author reviews the literature from the earliest description of Dupuytren's contracture by Sir Astley Cooper in 1822, to the present time, and tabulates cases to show the preponderance of males with either right hand or bilateral involvement.

The pathological change is in the palmar aponeurosis where increased vascularization and round cell infiltration in proliferating connective tissue gives way, in time, to a tendonlike cord, and gradual contracture of this cord causes severe flexion deformity of the fingers usually on the ulnar side of the hand. Deep extension of the process may surround the vessels and nerves, but the flexor tendons themselves are never included in the pathological process. Subcutaneous fat and, sometimes, palmar skin degenerate into this fibrous tissue. (Plantar fascia may be similarly affected, and the lesion is localized to the tibial portion of the aponeurosis.)

Many surgical procedures have been advanced to offer relief to the patients. All have been directed toward excision of all or part of the palmar aponeurosis, division of the palmar aponeurosis, or digital amputation. Various types of procedure are outlined, and several palmar approaches are illustrated. The consensus of opinion is that incision must be adapted to the individual case, but should, as nearly as possible, follow the palmar creases. Great care must be taken to avoid injury to the embedded vessels and nerves which may be widely displaced.

The prognosis must be guarded as to recurrence, which is frequent, and tender or insensitive fingers may be handicapping in the absence of recurrence.

During a period of 16 years in the Orthopedic Hospital in Copenhagen, 164 hands of 111 patients were treated for this condition. The cases were classified according to Meyerding's grading, and a total of 84 hands were operated upon. The surgery performed was partial excision of the palmar aponeurosis and/or digital amputation.

Over the period covered there was an increasing tendency toward wide excision rather than simple section of the contracting bands. Only 7 cases required skin grafting, all of which "took" and healed satisfactorily. The usual dressing consisted of dry gauze and a sea sponge compression bandage, with or without extension splinting of the fingers. Active motion was instituted after removal of the skin sutures on the 14th day, and restoration of function was facilitated by the use of warm baths, exercise, iontophoresis with potassium iodide, and other physical therapy.

A follow up of 62 hands over a period from 6 months to 12 years showed 43 cases, or 69 per cent, to have excellent results; 7 cases, or 11 per cent, with fair results; and 12 cases, or 20 per cent, with poor results.

Indications for operation are (1) mild cases occurring in early life when excision of the palmar aponeurosis of the 3 ulnar fingers is prophylactic against the sure slow progression of the disease; (2) severe cases in mature life if the patient is handicapped by deformity and gives reasonable promise of being able to heal a surgical wound. Excision of the aponeurosis or amputation of the affected finger with excision of the adjoining aponeurosis are to be determined upon the merits of each individual case.

Case reports on 12 patients exhibiting poor postoperative results are appended.

FRANCES E. BRENNECKE, M.D.

Frostad, H.: Rupture in the Aponeurosis of the Shoulder Joint; Particularly Referring to Its Treatment. *Acta chir. scand.*, 1946, 93: 33.

The 243 arthrographically studied shoulders and 64 shoulders studied at autopsy are classified as to the type and extent of the damage to the aponeurosis. Of the 76 with complete rupture, 23 were operated upon by the author and these form the material for this article. Codman's criteria for classification are discussed and accepted.

The incidence of rupture of the aponeurosis of the shoulder is greatest in men and women from 40 to 65 years of age and usually with a history of recent trauma. This may have been a fall directly upon the shoulder or the partly abducted arm, or a heavy strain in the long axis of the arm. Calcified deposits have been found in some ruptured tendons, and obviously predispose toward rupture. Findings indicate that the damage must often antedate the trauma which acutely calls attention to the shoulder.

Surgical inspection of recent ruptures shows either broad retracted tendon stumps suitable for suture, an absent peripheral stump with roughened bone marking its previous insertion, or avulsion of a portion of bony tubercle with the tendon. The latter finding is more frequent in younger patients, and the avulsed portion usually reattaches itself more readily if the bony fragment is sizeable.

In chronic cases the tendon stumps atrophy, and the irregular bony prominence of the tubercles and adjacent surface of the humeral neck is exaggerated by the loss of bony substance in the intervening areas.

Symptoms of a fresh rupture are primarily point tenderness over the site of the tear, and great pain on attempted abduction of the shoulder. A chronic rupture presents more generalized pain, decreased mobility, with often crepitation on motion, and some degree of atrophy. Arthrography may be necessary to make the differential diagnosis from other shoulder lesions. Communication between the bursa and joint indicates complete rupture, and defects on the under surface of the aponeurosis indicate an incomplete rupture. Often atrophy and erosions are seen in the region of the humeral neck and tubercles.

Treatment aims to relieve pain, re-establish mobility of the shoulder joint, and restore strength to the arm. Conservative treatment usually suffices for incomplete tears as the edges gradually smooth off and as pain disappears the mobility increases. It is imperative that the patient continue active motion from the start to avoid secondary rigidity. Occasionally a week's rest on an abduction splint may be required for the relief of pain.

If complete rupture occurs and conservative treatment is not adequate, surgery is indicated. Suture is the desirable procedure in a recent trauma, when there is sufficient stump at each end to provide a good hold for the suture. As late as two months after trauma, suture has yielded a good result. A direct lateral incision, splitting the deltoid fibers lengthwise and opening the roof of the bursa, gives adequate exposure and facilitates early resumption of motion. An abduction splint is used for from 3 to 5 weeks, passive motion is begun in 1 week, and active motion after 3 weeks.

In old tears the methods of Wilson, Hjort, and Strom have been used. The author describes these methods and then presents his own simpler operation, intended chiefly to restore a smooth surface on the humerus which will glide beneath the acromion without pain. The approach which has been described is used, and all irregular areas of bone or tendinous stump are planed off, particularly in the region of the tuberosities. In recent ruptures in which good stumps are present, suture is done also. The more radically the smoothing off of the humerus is done, the better the result. A few sutures in the deltoid fascia and the skin suffice for closure.

Passive motion is started the day of operation and often is painful for the first 3 or 4 days. No splint is used, the patient resting his arm on his side for comfort. Active motion should be started on the fourth day and increased as the wound is healed. The average hospital stay in 10 cases was 16 days.

Re-examination from 6 months to 2 years following operation showed that 9 patients worked full time from 2 to 4 weeks after leaving the hospital and 1 patient worked 2 months after leaving the hospital. In 7, normal range of motion was present; 3 had slight limitation of motion; 2 had occasional pain, and 8 had no pain. The strength of the involved

shoulder equalled that of the opposite one in 5 patients and was reduced but good in the other five.

The 7 patients whose ruptures were sutured had longer hospitalization, from 5 to 10 weeks, and returned to work in from 2 to 5 months postoperatively. The range of motion and strength of shoulder were similar to the former group, and the patients had no pain. In each group a single patient developed an articular fistula which closed spontaneously in 3 weeks.

The advantages of simplicity of operation, avoidance of prolonged immobilization, and early return to work, with relief of pain and improvement of both the mobility and strength, recommend this method of treatment. FRANCES E. BRENNECKE, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Boppe, M. and Leroy, M.: Results of Stabilizing Operations on the Bones in Paralytic Feet, with or without Transplantation of the Tendons (Résultats des opérations de stabilisation osseuse soules ou associées aux transplantations tendineuses dans le traitement des pieds paralytiques). *Rev. chir.*, Par., 1945, 64: 145.

The authors report on 78 cases of stabilization of the bones in paralytic feet, discussing the technique of the different operations in detail, and giving the indications, the causes of failure, and the final results.

The best age at which arthrodeses or arthroereises should be done is between 12 and 13 years. At this time the chances of obtaining good ankylosis are best, and there is little danger of secondary deformity caused by abnormal pressure and muscular traction during the growth of the bones. Under the age of 9, arthrodesis is strictly contraindicated.

The failures consist in fibrous pseudarthrosis, fracture of the bone grafts, or secondary deformity.

In 22 of the 78 cases, transplantation of the tendons was done in addition to the bone surgery, partly at the same time, and partly some months after the arthrodesis. The last method gave the best results.

The detailed discussion of the various surgical procedures should be read in the original article.

WERNER M. SOLMITZ, M.D.

FRACTURES AND DISLOCATIONS

Do Amaral, A. C.: The Treatment of Fractures of the Neck of the Femur by the Brazilian Method of Godoy Moreira—Extra-Articular Nailing (Tratamento das fraturas do colo do femur pelo método brasileiro de Godoy Moreira—aparafusamento extra-articular). *Rev. méd. Municipal*, 1945, 6: 245.

This article includes an extensive review of the problem of femoral fractures, with special consideration of those involving the femoral neck, and describes the treatment evolved by Godoy Moreira.

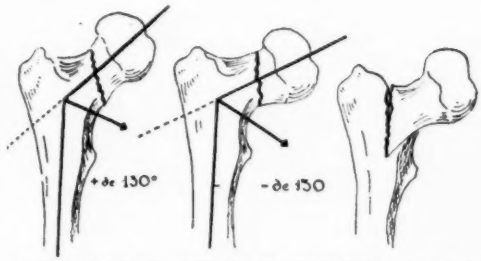


Fig. 1. At left are seen the two varieties of medial fractures of the femoral neck: In valgus, with the angle greater than 130 degrees; in varus, with an angle less than 130 degrees. On the right is seen the lateral type.

The author presents a general description of the anatomy, development, architectural features, and lines of stress associated with fractures of the neck of the femur.

Discussing the vascular supply of the upper portion of the femur, the author quotes the work of Zarzaga. He concludes that the blood supply to the hip joint and upper portion of the femur is maintained by an anastomosing arterial plexus derived ultimately from the profunda femoris and the internal iliac arteries. This includes branches direct to the bone, as well as the artery of the round ligament.

Fractures of the upper femur are discussed in the light of their classification by several methods. The author prefers to classify fractures of the neck as medial and lateral. The medial fractures may be in valgus or varus (Fig. 1). The medial fractures are difficult to hold in reduction and, therefore, offer a more serious prognosis, particularly when in varus as they then require surgical fixation. Lateral fractures are much easier to maintain in reduction and offer a better prognosis. Immobilization in plaster is frequently the treatment of choice.

Fractures of the femoral neck constitute approximately 40 per cent of femoral fractures and of these, according to the author's classification, the lateral type is the most frequent, and the medial type in varus is next in the proportion of 4 to 1. The medial type in valgus is relatively rare.

The mechanism of these fractures is discussed. The symptomatology is developed in some detail. The symptoms and signs common to all types of fractures of the femoral neck are dysfunction, attitude of the member, pain, deformity of the inguinal fold (Laugier's sign), shortening (8 measurements and methods of measurement are described), hydrarthrosis of the knee, ecchymosis, and edema of the base of the coccyx. The medial type of fracture, complete and not impacted, which is the usual type, completely prevents active motion and extreme external rotation; shortening is immediate, Laugier's sign is present, and the inguinal mass is well medial; spontaneous pain is not very marked, but pressure on the femoral head and passive motion are painful. When impacted, some active motion is usually pos-

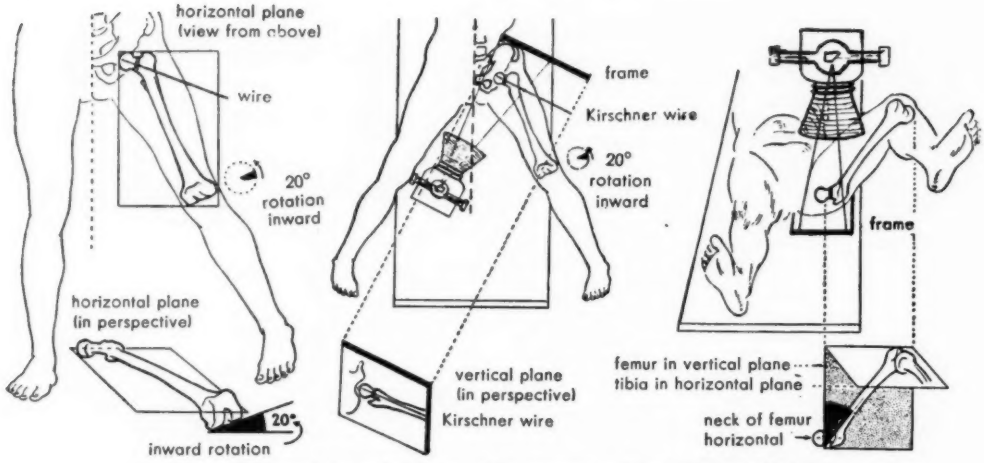


Fig. 2. Position of the patient, x-ray tube, cassette and projections of the femur; at left, A-P projection; center, the lateral projection; at right, the "lithotomy" position.

sible; Laugier's sign is not marked, nor is the shortening pronounced.

In the lateral type with impaction, which is the rule, movement is possible. The member is externally rotated; the thigh and knee are semiflexed and usually the thigh is adducted, although abduction is seen; shortening is pronounced; Laugier's sign is present and lateral in position; spontaneous pain is not great, but pressure over the greater trochanter and passive motion are very painful.

Prognostically considered, fractures of the femoral neck result in (1) bony union in anatomical position, (2) bony union in poor position, (3) bony union with or without accompanying arthritic changes, and (4) pseudarthrosis. The medial type of fracture, particularly in old persons, offers a poor outlook for a completely satisfactory result when managed by current methods. Lateral fractures, however, result in a satisfactory outcome consistently. A pseudarthrosis in this type is exceptional.

The complications occurring in patients with the lateral fracture include fat embolism, intra-articular suppuration, phlebitis, urinary retention, decubitus ulcers, and, finally, lung involvement.

The complete diagnosis of these lesions requires use of the x-rays. Not only are they required for accurate determination of the presence of fracture and its type, but also for control of the operative procedure. The x-ray views should include the anteroposterior, the lateral in position of reduction, and the lateral with the patient in the lithotomy position (Fig. 2).

The treatment of these fractures according to the author's classification can be summarized as follows:

1. Medial fractures in valgus are to be treated operatively in the aged and by simple extension in the young.

2. Medial fractures in varus are to be treated operatively regardless of age.

3. Lateral fractures are treated in plaster in the young and in the older patient who is in good general condition. In old patients in poor condition, operative intervention is indicated. (Children are not considered in this discussion).

An exhaustive description of the various methods of treatment and a summary of the results accompanied by illustrations are given. The methods discussed include that of Lucas Championniere; continuous extension; and immobilization in plaster, by bone graft, by osteotomy, by resection and ankylosis, and, finally, by metallic extra-articular fixation.

The method of Godoy Moreira, in summary, follows:

After the fracture is reduced under roentgenographic control, a 10 cm. incision down to the bone is made at the level of the greater trochanter. The muscle mass is separated in order to visualize the lower aspect of the trochanter (called the innominate tubercle) which serves as a guide for the procedure. At this point a small initial defect is made in the bone. The direction of the femoral head and neck is obtained by using the standard anatomical landmarks, aided by a metallic centimeter ruler placed over the anterior upper thigh in the presumed direction of the femoral neck. This ruler is included in the postreduction roentgenogram. A Kirschner wire is then introduced with an electric motor; however, it is finally driven to contact the cortex of the femoral head by the use of a hammer. An 11 mm. drill is used to tunnel the greater trochanter in order to accommodate the locking shaft of the apparatus later. The tunnel through the neck is completed with a 6 mm. drill so as to receive the body of the

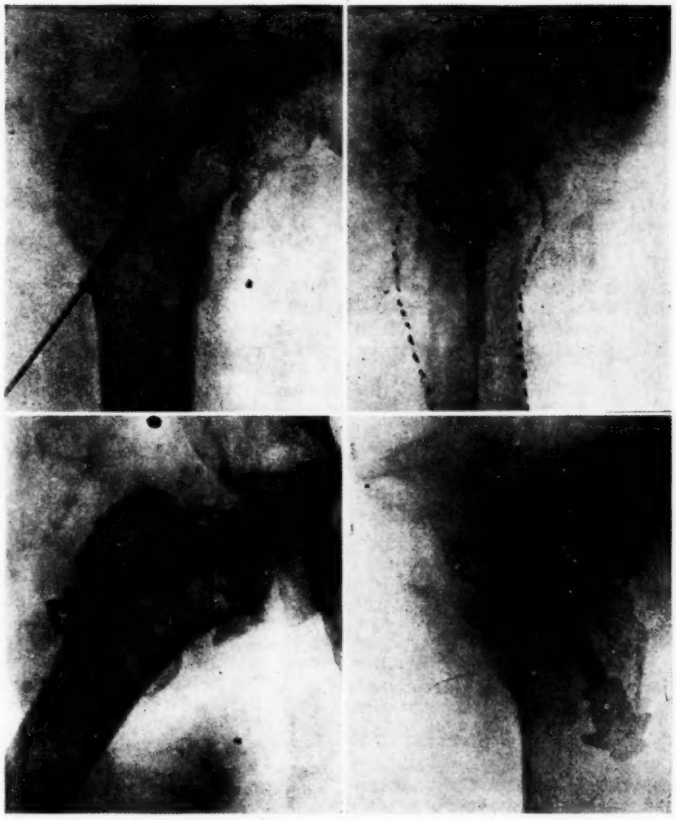


Fig. 3. Final roentgenographic control before and after the impaction.

screw. The drills and the screw are hollow and are threaded over the Kirschner wire as a guide. The fragments of the fracture are finally impacted with the locking shaft and counter screw. (The wire is removed after the introduction of the screw.) The fragments are held immobilized during the procedure by a special lever held by an assistant against counter pressure on the pelvis by still another assistant.

The author has introduced some modifications in the method, and the patients are managed along the following general lines:

The diagnosis of fracture having been made and surgical intervention having been decided upon, the patient is placed in light traction in extension, abduction, and internal rotation for a period of from 8 to 10 days. The Hawley-Scanlan orthopedic table is employed but modified by being divided into two longitudinal halves, presumably displaceable but no longer than sufficient to reach the patient's knees, so that the x-ray tube may be brought up between the knees for taking the lateral roentgenogram. The pelvic support is made of wood. A means of rapid film development is used. General anesthesia is not employed.

The fracture is then reduced. With the anatomical landmarks as a guide, a Kirschner wire is introduced with an especially designed electric motor, for a distance of from 4 to 6 cm. only. Roentgenograms are then taken in anteroposterior and lateral projections to determine the adequacy of the reduction and the direction of the wire. If the direction of the wire is not satisfactory, another is similarly introduced with the necessary correction, without removal of the first. The proper screw is then selected, and the Kirschner wire is taken as a measure, since it is of known length (30 cm.). The area of the wire is then laid open by a small incision down to the bone. An 11 mm. drill is then used to tunnel the cortical bone for a distance of 2 cm. The screw is

then passed over the wire as a guide and set into the head of the femur without further preliminary drilling. The locking shaft and counter screw are then set, the fragment being impacted as desired. A roentgenographic check is made again. No immobilization is used postoperatively. Active and passive motion, as well as sitting, is begun promptly. Walking is delayed from 45 to 60 days.

Later experience suggests that a Kirschner wire can be fixed to the skin of the thigh in the proper direction of the head and neck, as determined by fluoroscopic control, and then the transfixing wire can be introduced, this wire being used as a guide in association with lateral fluoroscopic control. An additional wire is recommended even if it is demonstrated that the first is correctly placed, in order to prevent rotation or slipping of the fragments during the subsequent steps.

Twenty-four cases have been treated by this method and 6 others by means of the Smith-Petersen nail. Twenty-seven of the cases were medial type fractures in varus, 2 were lateral, and 1 was a pseudarthrosis of a year's duration. The patients ranged from 28 to 85 years of age. Twenty-one of the 30 cases resulted in excellent bony union; 3 developed pseudarthroses (these were considered poor results); 1 other case developed pseudarthrosis, but was classed as having a good result because the screw permitted walking. The results in 2 cases cannot as yet be evaluated (5 months). On patient died; 2 patients did not tolerate the screw, requiring its removal in 8 and 75 days, respectively. The latter patient eventually succumbed to cardiorenal disease. Associated diseases in these patients have often been serious. HIRAM T. LANGSTON, M.D.

Hampton, O. P., Jr.: Delayed Internal Fixation of Compound Battle Fractures in the Mediterranean Theater of Operations. *Ann. Surg.*, 1946, 123: 1, 238.

This article, written in two parts, presents a follow-up study and evaluation of the treatment of 332 compound battle fractures treated in the Mediterranean theater of operations by delayed internal fixation. Plates, screws, and wire were the modalities of internal fixation employed. Part I describes the procedures, statistics, and conclusions. In Part II 20 case reports with illustrations are provided to demonstrate the problems involved.

The use of delayed internal fixation in the Mediterranean theater of operations began in April, 1944, and the great majority of the operations were performed between June 4, 1944 and November 1, 1944. The operations were performed in 18 base hospitals by approximately 50 surgeons. The information for this report was gathered by the author between March 16 and April 26, 1945 and represents a follow-up period of less than a year for the majority of the cases. Twenty-four Army general hospitals located throughout the United States were visited during this 6 weeks and 300 complete case reports were assembled. Thirty-two additional patients were located as on duty, demobilized, or in convalescent hospitals, and this status was considered as reasonable assurance that the results were very satisfactory. Although not specifically stated, it is presumed that the report covers all the compound battle fractures treated by delayed internal fixation during the dates mentioned. No comparison is made in this article between the results in these cases and similar data for groups of battle fractures managed without the use of delayed metallic fixation.

Initial surgery as compared to reparative surgery is the excisional phase which is designed to save life and limb and prevent infection. It is performed in the combat zone as soon after wounding as is feasible. Reparative surgery is performed in a base hospital from 5 to 10 days after wounding and the routine procedure for compound fractures is as follows:

The operating room is set up for any possible indicated surgery on a compound fracture. The patient is properly prepared and is anesthetized in the operating room, where the encasement and dressing which had been applied after initial surgery are removed. The extremity is cleansed, prepared, and draped. The wound is visualized thoroughly by gentle traction. Any residual dead tissue is excised and the depths of the wound are cleansed of old blood clot. The fracture site is exposed. It is there and then that internal fixation may be employed as part of the first procedure of reparative surgery if its advantages are obvious, e.g., in condylar fractures of the joints, oblique fractures of the long bones which are easily reducible, or segmental defects due to bone loss. Wound closure, usually with drainage, completes this stage of reparative surgery. In the great majority of cases, reduction is attempted by traction or manipulation. If adequate reduction is not achieved and the contour of the fracture permits, internal fixation may be performed at another operation, perhaps after wound healing. Internal fixation was not reserved for the ideal case but was employed frequently in fractures that would be major problems under any plan of management.

The advantages of delayed rigid internal fixation in the management of a compound battle fracture are: (1) Optimal apposition and alignment; (2) elimination of the dead space of an unreduced fracture, and its attendant traumatizing manipulations; (3) early joint motion and muscle exercise may be permitted; (4) multiple operating room procedures for concurrent injuries are permitted; and (5) staged procedures for the compounding wound are facilitated. The disadvantages of delayed internal fixation in these injuries may be stated as follows: (1) any periosteal stripping incident to the open reduction and placement of the metal potentially devitalizes the denuded cortex of bone; (2) the extent to which the metal interferes with the reattachment of soft parts to denuded bone enhances the chances of sequestration; and (3) the trauma incident to the fixation, retractor pull or vessel ligatures, may devitalize the soft tissue and thereby establish a nidus for wound sepsis.

The indications for delayed internal fixation were divided into three groups: obligate, desirable, and elective. The obligate group was again divided into 5 groups: (1) bone loss producing a segmental defect or persistent distraction, in either of which nonunion is almost inevitable; (2) inadequate reduction by nonfixation measures, skeletal traction, "hanging cast", or manipulation; (3) condylar fractures at the knee or elbow; (4) massive loss of soft tissue which demanded repeated staged procedures and preferably a fixed fracture; and (5) associated nerve trunk injuries, the optimum management of which required fracture fixation. The desirable indications varied with the bone involved and all fixations were performed at the first operation of reparative surgery as follows: the femur was rigidly stabilized with plates or screws in the nonobligate group; the tibia and fibula were rigidly stabilized with screws only in the nonobligate group; the radius and ulna were subjected to all types of fixations in the nonobligate group. No indications were classified as desirable among the fractures of the humerus. For the elective indications, all fixations were done at the first operation of reparative surgery. These included all wire loop fixations of the femur in the nonobligate group; all platings (including those of the fibula) and wire loops of the tibia and fibula in the nonobligate group; and all types of fixation of the humerus in the nonobligate group.

The results of delayed internal fixation were classified into 6 groups summarized as follows:

Result A. Union of the fracture and wound healing without sequestration or removal of the metal.

Result B. Union of the fracture, and, following removal of the sequestra and metal, wound healing.

Result Ba. The same as B but the sequestration was massive, so as to prejudice the strength of the bone.

Result C. Union of the fracture but no wound healing; however, in many cases the metal and sequestra were not removed.

Result D. Union of the fracture and wound healing after removal of the metal and sequestra, but the time required for each was prolonged appreciably.

Result E. Nonunion of the fracture but wound healing without sequestration or removal of the metal.

Result F. Nonunion and sequestration without wound healing (in 5 cases the wounds healed after removal of the sequestra and metal).

Detailed statistical tables of data are compiled to show: (1) results in relation to the type of fixation, (2) results in relation to the indications, and (3) a summary of all results: (a) those not classed as excellent and (b) those not very satisfactory.

Each of the 25 cases with the F type of results is abstracted and an appraisal of them is offered by the author: (1) improvement following fixation, 2 cases; (2) no improvement, but healing not retarded, 8 cases; (3) healing retarded, 13 cases (3.9 % of 332 cases); and (4) not classifiable at this time, 2 cases. An example of the complications in the F group is quoted from the abstracted tibia and fibula cases—"Cases 4–9 (Four electives and two obligates—one for bone loss, one for faulty reduction). All were plate fixations. The sequestration was massive, wound healing was not achieved and the resultant scar will be excessive. These are failures in every sense and the surgery contributed directly to the prolonged disability. Bridging bone grafts will be necessary in several." The following conclusions are drawn:

1. There is a definite place for the use of delayed internal fixation in battle fractures in the fixed installations of the communications zone.

2. Its use should be as an adjuvant to fracture management under the principles previously expounded for reparative surgery of compound fractures.

3. The results achieved in this group of cases are deemed very satisfactory with the exception of those in the plated fractures of the tibia and fibula and those associated with massive soft-tissue loss (obligate-4), particularly when they are evaluated in the light of their adjudged indications.

4. In the light of the results achieved in this series it seems reasonable to state that by the use of delayed internal fixation:

a. Nonunion of fractures with segmental defects or persistent distraction may be prevented in many cases, as is evidenced by the achievement of bony union in 27 (69%) of 39 cases in this series.

b. Varying degrees of malunion or, perhaps in some cases, delayed or nonunion of fractures, for which inadequate reduction was achieved by other measures, may be prevented in many cases, as is evidenced by the achievement of bony union in good apposition and alignment in 64 (85%) of 75 cases in this series.

c. Bony union in the optimal reduction of condylar fractures about the knee and elbow may be achieved, as is evidenced in 100 per cent of 15 cases in this series.

d. The obvious advantages of well stabilized maximum reduction of fractures which lend themselves to rigid stabilization and satisfactory wound healing may be achieved in many cases, provided the fixation is performed by multiple screws with minimal periosteal stripping, as is evidenced by union in good position in 94 (98%), and wound healing without sequestration or the removal of metal in 71 (74.7%) and in another 14 (14.9%) after the removal of sequestra and metal in a total of 95 cases. If plating is the method of fixation, bony union and satisfactory wound healing may be anticipated in a smaller percentage of cases, as is evidenced by union in 140 (84.3%) and wound healing without sequestration or removal of metal in 99 (59%), and readily in another 34 (20.3%) after removal of sequestra and metal in a total of 168 cases.

e. Improved apposition of the fragments may sometimes be accomplished with the aid of

wire loops, as is evidenced by the achievement of bony union in 59 (85.5%) and of wound healing without sequestration or removal of metal in 50 (72.5%), and in another 12 (17.4%) after removal of sequestra and metal in a total of 69 cases regardless of any other qualifying factors.

5. The hazard of delayed internal fixation appears to be increased sequestration, which may be explained by the periosteal stripping which the procedure entails. Sequestration occurred in 34.3 per cent of the cases in this series and it seems reasonable to state that with:

a. Screw or wire fixation, sequestration is seldom massive, does not seem to interfere with union of the fracture, and probably would have occurred in many cases had nonfixation measures been employed.
b. Plating, followed by sequestration in 41 per cent of 168 cases, is sometimes followed by massive sequestration and retardation of the attainment of full strength of the bone. It may create a massive defect reparable only by bone grafting.

6. Unless the fracture contour permits a rigid fixation by screws or unless wire loops appear advantageous, it is preferable to attempt reduction by traction or manipulation and strive for early wound healing.

a. Following wound healing, fixation by plating or other fixation is relatively nonhazardous, as is evidenced by wound healing in 95 per cent of 21 cases in this series without sequestration or removal of metal.
b. Fixations of the long bones of the upper extremity may be expected to give excellent results if the severity of bone loss or of the soft tissue injury does not prejudice the chances of union and wound healing.
c. Fixations of the femur performed on indications, with multiple screws or wire loops and with minimal periosteal stripping, may be expected to give excellent results.
d. Fixations of the tibia by multiple screws or wire loops may be expected to give very satisfactory results. Plating of the tibia should be reserved until after wound healing. In the cases of tibia fracture, 8 of the 9 failures and 6 of the 8 massive sequestrations followed plate fixation.
e. The plating of the fibula in a fracture of both bones may be a useful procedure which is relatively nonhazardous. It maintains length and alignment, aids in achieving apposition of the tibial fragments, and provides some degree of immobilization of the fracture of the tibia.

7. Internal fixation as an adjuvant to the management of the unreduced septic compound battle fracture may aid in the control of sepsis and in achieving the best obtainable result. Among 29 cases in this series bony union was achieved in good alignment in 20 (69%), wound healing without further sequestration in 13 (45.5%) and after removal of sequestra and metal in 13 (17.5%) additional.

8. The indications for delayed internal fixation can be defined only for those instances in the management of the wounded in which the advantages offered by maximum fracture reduction and (usually) stabilization would not be overshadowed by other considerations. With this qualification it may be stated that the indications for the use of delayed internal fixation in the base hospital either at the initial operation of reparative surgery or later are:

a. Obligate
   (1) Segmental defects or persistent distraction of fragments
   (2) Inadequate reduction by other measures
   (3) Displaced condylar fractures
   (4) Associated nerve surgery which can be facilitated greatly by fixation
b. Desirable (advantageous)
   (1) Fractures of the long bones (especially the femur) the contour of which permits rigid stabilization by multiple screws with minimal periosteal stripping
   (2) Fractures in which nonrigid fixation by wire loops will provide a degree of fracture reduction probably not attainable without it

9. Further study of this problem and a comparable study of fractures managed by nonfixation measures are definitely indicated. Each case should be evaluated in the light of the problem confronting the overseas surgeon and the anticipated result by fixation and nonfixation measures.

CHARLES A. WALTMAN, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Rose, C. A., Hess, O. W., and Welch, C. S.: Vascular Injuries of the Extremities in Battle Casualties. *Ann. Surg.*, 1946, 123: 161.

This article is based on experiences in the management of 100 consecutive patients with arterial injuries of the extremities encountered in an evacuation hospital in the European campaign. Only major arteries were considered.

The diagnosis of arterial injury in the extremities was not difficult in most cases, i.e., when a cold pulseless limb was observed unilaterally. However, in two types of cases the diagnosis was less obvious. Badly shocked patients with no palpable peripheral pulses in any extremity had to be re-examined frequently for evidence of arterial injury as their condition improved. In addition, it was possible to have palpable distal pulsations in cases with small lacerations of the arteries. A firm hematoma in the region of a small wound was particularly suggestive of arterial laceration since venous bleeding rarely caused arterial compression even in such a closed space as the popliteal fossa. It was rare to find the classical signs of arterial aneurysm or arteriovenous fistula early after injury.

Plasma was used preoperatively in treating patients in whom there had been little loss of blood, but many of these patients had lost upward of 2 liters of blood and shock was frequently severe. Blood transfusions of from 500 c.c. to 3,000 c.c. were given to 55 of the 100 patients. There was practically never active bleeding at the time of admission but during treatment for shock, the rise in blood pressure was sometimes followed by recurrence of the hemorrhage. If the bleeding vessel could not be visualized and controlled quickly, a blood pressure cuff was applied as a tourniquet. Oxygen, and sulfadiazine, by mouth, and penicillin intramuscularly were all started preoperatively and continued as long as indicated.

Careful débridement was performed through the extended existing wound, but care was used to avoid damage to all vascular radicles which could provide collateral circulation. Nine patients required primary amputation besause of extensive wounds more than 16 hours old which were complicated by compound fractures and severed arteries with extensive distal thrombosis. In 5 cases, arteriorrhaphy was performed. The arterial wounds were small and easily repaired in each instance, and none of the wounds were associated with extensive tissue damage. Ligation of the injured artery was done in 70 cases. Thrombosed or damaged segments were excised and the companion veins were similarly ligated and severed. Eight patients were subjected to arterial anastomosis performed by the nonsuture technique of Blakemore and Lord. One patient died at operation from a pulmonary embolism; 5 patients developed gangrene afterward; 2 operations were followed by a viable extremity. The authors believe that in both of the latter cases the collateral circulation was good enough to have saved the extremity without arterial anastomosis. Heparin was used in only 2 cases and in both of these gangrene developed. The poor results of the Blakemore method are attributed to the lack of patency of the arterial system distal to the anastomosis, even though the procedure was limited to patients treated within 14 hours of the time of injury. Eight patients were treated conservatively, i.e., by débridement only. In 2 of these, gas gangrene developed and amputation became necessary. The other 6 recovered with viable extremities. The results are given in the following table.

Treatment	Results	
	Good	Poor
Primary amputation	0	9
Arteriorrhaphy	5	0
Ligation	33	37
Nonsuture anastomosis	2	6
Débridement only	6	2

Postoperative treatment included the use of alcohol and papaverine for vasodilation and of sympathetic blocks with 2 per cent procaine. Refrigeration was attempted in only a few cases. Only 2 lumbar sympathectomies were done. Because of the damage to the collateral vessels which was frequently present, the effect of these various procedures was not striking. Despite the routine use of sulfadiazine and penicillin, gas gangrene developed in 12 patients, of whom 11 were subjected to amputation. Three died of the infection. There were 3 other deaths from crush syndrome, pulmonary embolism, and a severe hemolytic blood transfusion reaction, respectively.

An analysis of the results showed the factors which determined the prognosis for survival of an extremity with injury to a major artery. The time factor seemed important inasmuch as two-thirds of the limbs survived when surgery was performed within 10 hours of wounding, whereas less than one-fourth survived after 20 hours. As was expected, the prognosis was better when the degree of arterial injury was not severe. The influence of the degree of tissue damage was striking. The survival rate of the limbs with slight tissue damage was 85 per cent but only 21 per cent of those with severe tissue damage were saved. The effect of the anatomic location of the arterial wound was consistent with acknowledged principles; namely, that the prognosis for interruption of the major vessels was better in the upper extremity than in the lower extremity, and injuries that involved major collateral vessels resulted most often in gangrene.

THEODORE B. MASSELL, M.D.

Pratt, G. H.: The Surgical Management of Arterial Occlusion. *J. Am. M. Ass.*, 1946, 130: 827.

The author outlines his methods of treatment in various conditions presenting acute arterial occlusion. Traumatic laceration of an artery is repaired by a continuous fine silk stitch which does not pass through the intima. The suture line should be reinforced by wrapping a strip of fascia or muscle around the site of repair. Treatment after arterial suture includes the use of anticoagulants, sympathetic nerve blocks, and the administration of vasodilator drugs.

Incomplete laceration of a major artery may result in a false aneurysm. For arterial aneurysm the sac is obliterated but not excised, in order not to injure the collateral vessels which run in or near the sac wall. When contusion causes local thrombosis the author advocates opening of the artery and removal of the thrombus.

Embolism of a major peripheral vessel usually occurs at a point of bifurcation. While embolectomy should be done within 24 hours, the author reports success following removal of an embolus of the bifurcation of the aorta 60 hours old. An approach just below the inguinal ligament is advised. After the clots are removed the artery is washed with heparin.

Postoperative treatment includes the use of anticoagulants and sympathetic nerve blocks.

Acute occlusion may be caused by infection with the streptococcus or the gas producing group of clostridia. The presence of crepitation in the tissues does not alone constitute an indication for amputation. The diagnosis of a gas bacillus infection should be made on the clinical picture: fever, a high pulse rate, sanguineous drainage from the wound, massive edema, and the anxious sick look of the patient.

Scalenus anticus syndrome may cause thrombosis of the subclavian artery. After scalenotomy the author advises sympathetic blocks or a preganglionic thoracic sympathectomy.

THEODORE B. MASSELL, M.D.

Dandy, W. E.: Results following Bands and Ligatures on the Human Internal Carotid Artery. *Ann. Surg.*, 1946, 123: 384.

In the surgical treatment of intracranial aneurysms it is at times necessary to occlude the internal carotid artery partially as a preliminary step before totally closing the artery. A partial ligation is necessary when the Matas test indicates an inadequate collateral circulation at the circle of Willis. In a group of 6 patients in whom a band of fascia lata had been placed for this purpose and in whom total ligation became necessary later, the segment of the artery, including the band, was excised at the second operation after intervals varying between 16 and 58 days. The specimens were subjected to gross and microscopic study principally to learn what happens to the affected portions of the artery and to the band. In addition, specimens following total ligation of the internal carotid (1 case), total ligation of the common carotid (1 case), and ligation of the intracranial carotid by a silver clip (1 case) were studied.

In the 6 specimens following partial occlusion of the internal carotid artery by fascial bands, the lumen of the artery remained patent, although greatly reduced in size. In only 1 case was there any indication of a thrombus within the lumen; in this case the thrombus was a tiny nonobstructing carunclelike fibrous nodule. In all cases there was an excessive bulbous mass of fibrous tissue about the bands. The size of the swelling increased with time, and at the end of 58 days was about four or five times larger than the original volume of the fascial band. The bands showed marked fragmentation in all specimens and could be delineated only with difficulty or not at all in the older specimens. A rather surprising histological finding was the absence of any reaction throughout the intima of the arteries, there being no tendency toward vascular rupture.

In the 2 cases, following total ligation of the carotids, there was extensive thrombus formation within the lumens, and it was clear from these cases that the extent of intra-arterial thrombosis resulting from total ligation is variable and unpredictable and is not, as has been frequently stated, limited by the first sizable branch (the external carotid).

The single specimen taken 19 days following application of a silver clip to the internal carotid is included in this report because there was no thrombus on either side of the clip. This was observed on at least 4 other occasions when the site of the clip was subsequently exposed at a second operation. That a thrombus is consistently absent after the application of a silver clip cannot be stated without many more observations. However, in a series of 38 intracranial "clippings" of the internal carotid there has never been any clinical evidence of cerebral thrombosis. These findings indicate a disadvantage in the use of a clip when thrombus formation is desired to cure an aneurysm.

It is very probable, but not certain, that a thrombus always develops in time on either side of a ligature on a large arterial trunk. Doubtless this is due to injury of the intima, which must always occur. And yet, bands of fascia and aluminum, whether partially or totally occluding, appear not to do this. The development of a thrombus after ligation and its absence following application of a band, are the reasons for need of a better form of ligation of the internal carotid. When a clot forms in the carotid it may break off and send an embolus into the cerebral arteries with disastrous results; or the clot may propagate from the site of the ligature and pass directly into the cerebral vessels with the same result. Either of these eventualities is the explanation for the hemiplegias and deaths that occur from 12 to 96 hours after carotid ligations. The author is certain that they can be avoided either by means of totally occluding bands of fascia or by ligation over a band of fascia. The ligature does not then cut the intima. The latter procedure is probably preferable and more certain.

JOHN L. LINDQUIST, M.D.

Loewe, L., Rosenblatt, P., and Hirsch, E.: Thromboembolic Disease. *J. Am. M. Ass.*, 1946, 130: 386.

The treatment of venous thromboembolic disease with the subcutaneous administration of heparin in the Pitkin menstruum was attended with lessened morbidity, prompt and rapid clinical improvement, and little or no residual edema.

After failures of treatment with other methods recovery has subsequently followed the routine administration of heparin in the Pitkin menstruum.

As a result of observations of its clinical results in 125 consecutive cases of thrombophlebitis and/or phlebothrombosis, the subcutaneous administration of heparin in the Pitkin menstruum is recommended as a safe, simple, practical, and effective method for the conservative treatment of venous thromboembolic disease.

Eleven cases are reported.

JOHN J. MALONEY, M.D.

BLOOD; TRANSFUSION

Lewis, J. H., Tagnon, H. J., Davidson, C. S., and Minot, G. R.: The Relation of Certain Fractions of the Plasma Globulins to the Coagulation Defect in Hemophilia. *Blood, J. Hemat.*, 1946, 1: 166.

The authors state there is evidence that by the parenteral administration of derivatives of normal cell-free plasma in hemophilia, the coagulation defect can be modified toward normal. They present a brief history of older work on this subject, and new evidence accumulated during the past 3 years. Competent investigators have shown that the coagulation defect in hemophilic blood could not be related to deficiency in the calcium ion, prothrombin, or fibrinogen of the plasma. Consequently, the investigations were directed toward an attempt to determine where the deficiency, if any, resided. It was determined that certain globulin fractions prepared by acid precipitates of diluted cell-free plasma at pH 5.5, and also similar globulin preparations obtained by simple dialysis against distilled or tap water, contained all the antihemophilic properties of the parent plasma.

It would appear that the antihemophilic properties of these globulin preparations were not due to the removal of inhibitory materials, since the parent plasmas were active and the supernatant fluids from the globulin precipitants had no inhibitory activity and only minimal coagulation activity. Furthermore, hemophilic plasma treated by the same method did not acquire any increase in antihemophilic properties. The exact nature of the antihemophilic material is not known. It is definitely associated with the plasma globulins, but whether or not it is a lipoprotein has yet to be determined. Howell termed the material "plasma thromboplastin," but evidence is lacking as to whether or not this nomenclature is acceptable.

As part of the blood substitutes program conducted during the war, large quantities of human plasma have been subjected to multiple fractionation by E. J. Cohn and workers in the Department of Physical Chemistry at the Harvard University Medical School, Boston. Various subfractions of the globulin group have been extensively tested for antihemophilic activity in the Thorndike Memorial Laboratory and extensive studies on the antihemophilic properties of fraction I are being carried out on adult patients in the Boston City Hospital. A discussion of these studies is presented.

Of equal importance with the shortening of the coagulation time of the circulating blood in hemophilia is the local control of hemorrhage when this occurs. The antihemophilic globulin substance acts as a local hemostatic when applied in dry form with adequate dressings to the bleeding point. Antihemophilic globulin preparations act, apparently, through the normal coagulation reaction and depend for their activity on the release of thrombin from prothrombin; hence an instantaneous arrest of hemorrhage does not occur.

Another globulin preparation may be obtained from human, bovine, rabbit, or swine plasma by a salting-out procedure. Investigators found that these pseudoglobulin preparations were thrombic in nature; they acted directly on fibrinogen without the intervention of calcium ion or prothrombin.

Hemostatic globulin is definitely superior to the antihemophilic globulin in the control of hemorrhage, since its action is immediate. In persons with hemophilia, it has been used to control bleeding following amputation, débridements, and dental extractions. In normal persons also it has been widely used, a notable example being its employment as a physiologic glue in skin grafting.

The question of possible toxic reactions to animal globulin preparation applied locally immediately arises. It may be reported that in using a rabbit hemostatic globulin, no untoward local effects or systemic reactions were observed following many multiple local applications of the substance in the control of hemorrhage in hemophilic and normal subjects.

In conclusion, the authors note that hemophilic blood appears to be deficient in some activity associated with the globulin fraction of the plasma protein. The chemical identity of the missing factor or factors is not at present known. However, it should be remembered that until final proof is obtained, both of these terms imply an association rather than identification of the antihemophilic activity with the plasma globulins.

Normal cell-free plasma and the antihemophilic globulin preparations derived therefrom will, on treatment with chloroform, give rise to a proteolytic enzyme system having some as yet undefined role in blood coagulation. In fractionations of human globulins, such spontaneous production of lytic agents has been found in subfraction II of fraction III, and occasionally in fraction I.

Hemophilic plasma does not produce such proteolytic enzyme systems in optimal amounts. Whether

this is due to the lowered amount of the precursor, or to the presence of inhibitor materials, is at present unknown.

The intravenous injection of antihemophilic globulin results in a marked acceleration of the clotting time of hemophilic blood. So far only fraction I of the plasma globulin has been used clinically. The dose of the material has not yet been determined, but single injections of 200 to 400 mgm. of the material will keep the blood of a hemophilic patient at low coagulation levels for from 8 to 12 hours.

For local hemostasis, a pseudoglobulin may be prepared from human, bovine, swine or rabbit plasma by a salting-out procedure. Thrombin from rabbit plasma has been used without untoward local or systemic reactions in amputations, débridements, and dental extractions in hemophilic patients.

HERBERT F. THURSTON, M.D.

Rainsford, S. G., and Morgan, W. T. J.: Determination of Blood Groups: Use of Rabbit Immune Serum. *Lancet*, Lond., 1946, 1: 154.

A method of rapid blood typing which would allow the accurate selection of men with group O blood for emergency transfusion was needed by the Royal Navy. It was believed that this selection would be made easier if a reagent could be supplied which would contain both anti-A and anti-B agglutinins. The difficulty of supplying such a reagent by mixing anti-A and anti-B serum from human sources was due not only to the reduction of isoagglutinin titer by simple dilution, but also to the fact that in most human sera there was some agglutinogen corresponding to that present in the cells of the blood from which the serum was obtained. The agglutinogens neutralize the homologous isoagglutinins and thus further reduce the anti-A and the anti-B titer of the reagent. These difficulties were to some extent obviated if the serum from an O blood were used; but it was found that although sera from O donors often showed higher anti-A and anti-B titers than were found in the sera of A and B bloods, they were not in most instances sufficiently potent to be suitable for use as blood grouping reagents.

Previous work by one of the authors (Morgan) on the production and properties of potent anti-A agglutinins in rabbits suggested that, if a similar serum specific for the detection of B-erythrocytes could be produced, a mixed immune rabbit serum containing these two agglutinins might be a reliable blood grouping reagent for the rapid detection of group O donors. One advantage which rabbit serum had over human serum was that at the dilution used the former was a clear colorless reagent whereas the latter was usually colored. This color rendered the rapid reading of the reactions without the aid of a microscope less definite.

Rabbits were immunized with an artificial antigenic complex made from purified human A substance. The serum was then pooled and absorbed so that the following titer was obtained for cells of different phenotype: A_1 and A_2, 20,000; A_2B, 10,000; B, 16; O, nil. To test the specificity of the rabbit anti-A serum, it was titrated in parallel with the human anti-A serum. The human serum was used at a dilution of 1:4 and the rabbit serum at a dilution of 1:200. There was complete qualitative agreement between the results obtained with the human and rabbit sera. The rapidity of the agglutinations was, however, greater with the rabbit serum than with the human anti-A serum. In the method of testing used, this greater avidity of rabbit serum for the cells was considered an important factor since the contact between the antigen and the antibody was necessarily limited because of the rapid and significant evaporation that took place from the large surface area of the mixed cell suspension and agglutinin solution.

During the early part of the investigation, and before a suitable anti-B rabbit immune serum had been produced, a mixed reagent was prepared from anti-A rabbit serum and human anti-B agglutinin. This mixed serum agglutinated all types of cells other than O within 5 minutes. The accuracy of tile agglutinations with the mixed serum was tested in a series of several thousand determinations by subsequent test tube agglutinations of the same bloods. The percentage error varied from 0.63 to 0.85 per cent. When human anti-A and human anti-B sera were used separately, the percentage error was 2.4 per cent.

For preparation of rabbit anti-B serum, the specific blood group B substance was obtained from pseudomucinous ovarian cysts. It was converted into a full antigen by combination with the conjugated protein component of the O somatic antigen of bacillus shigae by the method already described for the preparation of an artificial A antigen by Morgan. Rabbits were given serial doses of the artificial complex and were bled from 7 to 9 days after the last dose. The titer for B cells of one preparation of anti-B serum after absorption with A and O cells was 5,000; the preparation did not react against A cells at a dilution greater than 1:8. Bloods to the number of 1,093 were tested in duplicate by the tube method with the rabbit anti-B serum at a dilution of 1:25 and a human anti-B serum at a dilution of 1:4. There was complete agreement between the results obtained by the two sera, but more complete reactions were recorded with the rabbit serum. In tile agglutinations the rabbit anti-B serum was more reactive and showed greater avidity than the human anti-B agglutinin.

The accuracy of 961 rapid tile agglutinations with the mixed rabbit serum was checked by tube technique in the laboratory. The percentage of error was only 0.31 per cent. The authors conclude that the use of mixed anti-A and anti-B rabbit immune sera of high titer and avidity reduces the errors of blood grouping when O donors are to be selected rapidly from a group of untyped persons, and thus the mixed serum should prove of value in making the selection of blood for immediate transfusion more reliable.

THEODORE B. MASSELL, M.D.

Walsh, R. J.: A Report on the Transfusion of 2,386 Liters of Blood. *Med. J. Australia*, 1945, 2: 486.

The author presents an analysis of the use of 2,386 liters of blood. The reactions which occurred are discussed and the indications for transfusion are listed. Hemorrhage was the principal indication, and hematemesis was its most common manifestation.

Relatively there was a greater frequency of transfusions in obstetric practice. Two hundred and fourteen liters were used postpartum and 189 liters after abortion. Thirty eight liters were used in the treatment of ruptured ectopic gestations. Four hundred and sixty liters were used in the treatment of anemias and other blood dyscrasias. Two hundred and thirty-nine liters of blood were administered to patients suffering from carcinoma.

The author notes that the contention that group O blood is dangerous for transfusion to patients of other blood groups was not substantiated by his analysis. The alleged dangers of such a practice are examined in the light of recent knowledge and are herein discussed. Seventy-six per cent of the total amount of blood supplied was of group O. It is obvious, therefore, that group O blood was used for a large number of patients whose blood belonged to groups other than group O, inasmuch as only 49 per cent of the population have group O.

The Rh factor was found to be an infrequent cause of transfusion reactions. It is commonly stated that the most severe reactions are encountered in some of the blood dyscrasias. The data presented does not support this statement. Undoubtedly the most serious transfusion reactions are the hemolytic and the anaphylactic types. Hemolytic reactions with jaundice occurred in 4 cases. In 2, the Rh factor was found to be responsible. Two anaphylactic or anaphylactoid reactions were reported. One patient who had suffered from pernicious anemia for many years frequently neglected his treatment and reported on numerous occasions with very low red cell counts. For this reason he had received many transfusions over a period of 5 years. On this particular occasion, after the transfusion of 200 cubic centimeters of compatible blood, he suffered from an acute circulatory collapse with all the signs of an anaphylactic reaction. He gave sensitivity reactions to intradermal injections of the serum of one of the donors.

The danger of rapid transfusions to persons with a normal blood volume is stressed. Warnings for the slow administration of blood to patients with a normal blood volume have long been made by many writers, and the consequent dangers of circulatory overloading have been emphasized. There is usually little danger of circulatory overloading from the rapid administration of blood or serum to patients whose circulatory blood volume has been reduced; blood cannot be administered too slowly to patients suffering from blood dyscrasias, especially if myocardial weakness is present. Lack of consideration of this factor may be partly responsible for the impression that reactions are both frequent and serious in certain blood dyscrasias.

No evidence was obtained which would indicate that certain diseases render recipients susceptible to transfusion reactions. Sensitivity and pyrogenic reactions are discussed. The subject of pyrogens is complex. The author notes that such substances are a frequent cause of transfusion reactions, as was well shown by the experiences reported at Mount Sinai Hospital. This hospital reduced the incidence of transfusion reactions from 23 per cent to less than 13 per cent by close attention to the technique of cleansing and sterilizing apparatus. Great care to avoid pyrogens is exercised in the preparations of solutions, flasks, and other apparatus. Hospitals that pay attention to these details have a low reaction rate. The control of pyrogenic reactions rests to a large extent with the hospital or medical practitioner administering the blood.

Numerous factors cause blood transfusion reactions and are briefly mentioned. Reactions due to impurities in the solutions are minimized by the use of good quality chemicals. Clot formation in collected blood will render it toxic, just as defibrinated blood was found too toxic for general use. Small clots in a flask of blood are difficult to detect, but they are often responsible for reactions. The use of a blood filter will not remove their noxious influence. Hematoma formation due to difficulty in venepuncture either in the donor or in the recipient may be responsible for pyrexial reactions. Finally, undue venous congestion in the arm or leg of the recipient, caused by prolonged application of a tourniquet, may result in venous stagnation, with adverse effects on the recipient. In normal persons venous tourniquets may cause fainting and nausea if applied for too long a period. HERBERT F. THURSTON, M.D.

Grossman, C. M., and Saward, E. W.: Homologous Serum Jaundice following the Administration of Commercial Pooled Plasma. *N. England J. M.*, 1946, 234: 181.

The authors report 8 cases of hepatitis with jaundice following the use of commercial pooled plasma, one of which proved fatal.

These patients had incubation periods ranging from 54 to 139 days, which is in conformity with the incubation period of the experimentally induced disease. Only one of the patients was seriously ill. The autopsy findings in this case differed in no way from those in cases ending in death following hepatitis due to the administration of yellow fever vaccine, nor are the findings different from those in deaths from infectious hepatitis.

In the two-year period during which these cases were observed, 501 transfusions of commercial pooled plasma were administered. The plasma was purchased from a commercial manufacturer with nationwide distribution facilities, who states that each pool consists of at least 50 samples. The occurrence of 8 cases of hepatitis with jaundice gives an incidence of 2 per cent, but this represents a minimal rather than a true incidence, since many patients received more than one transfusion of plasma, and

patients who developed hepatitis and were treated as outpatients, or by physicians elsewhere, did not come to the authors' attention. Furthermore, patients who did not develop clinical jaundice but nevertheless had the clinical features of acute hepatitis, such as nausea, vomiting, anorexia, and malaise, were not included.

The true incidence of this condition is not known at the present time. Reports in the literature vary from as many as 26 of 47 cases receiving pooled serum to 10,000 transfusions of pooled plasma without any recorded evidence of homologous serum jaundice, although in the latter report the authors state that their method may not have supplied complete data. The reasons for this discrepancy are manifold.

Since there is a relatively high incidence of infectious hepatitis at the present time, it is only natural to attribute any example of this clinical picture to spontaneously occurring agents. The long incubation period of homologous serum jaundice separates the disease from the etiological event by such a long period that causal relation may be overlooked. Finally, many physicians may not be alert to this possibility because of the absence of information about this condition in the literature until the last few years. The incidence of this disease is undoubtedly becoming greater because of the increased use of commercially pooled plasma in cases in which transfusion of whole blood from a single donor was formerly used. The authors' experience confirmed this, since nearly 1,000 whole blood transfusions were given in the same two-year period with no case of manifest jaundice. The chance of the etiological agent's being given in any blood plasma therapy is many times increased as pools of 50 or more donors are mixed. The amount of icterogenic plasma necessary to contaminate a pool is minimal, since the disease can be transmitted by as little as 0.1 cubic centimeter.

In view of the disability, and the chance of fatality in homologous serum jaundice, the use of pooled plasma is not without danger. The fact that the icterogenic agent is not destroyed by drying and prolonged storage makes the tracing of the icterogenic sample difficult. Since it has been reported that the agent is destroyed by ultraviolet radiation, perhaps the hazard from the use of pooled plasma could be obviated by such a method.

CHARLES BARON, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Lam, C. R., and Hooker, D. H.: Pulmonary Embolism. *Ann. Surg.*, 1946, 123: 221.

The present review on pulmonary embolism is based on 118,611 operations performed during a twenty-one year period (1924-1944) at the Henry Ford Hospital, Detroit, Michigan. Of 280 cases of pulmonary emboli, 78 were fatal, an incidence of 1 fatality in every 1,500 patients operated upon. In 70 per cent of the fatal cases, the diagnosis was established at autopsy.

The authors point out that in the year of 1930, before the days of heparin, dicumarol, femoral vein ligation, and early ambulation, there was not a single case of fatal pulmonary embolus, while in 1943, when all of these preventive measures were available, there were 8 fatalities, although none of the 8 patients was given any specific prophylactic treatment.

All cases, fatal and nonfatal, are tabulated as to sex, age, type of surgery, and day of occurrence. Pulmonary embolism was more common in men than in women, the ratio being 3 to 2. Age increases the incidence of this complication, especially in the fifth decade, and fatalities occurred most often in the sixties.

The complication occurred most frequently following abdominal procedures. Gastric operations and prostatectomies were the worst offenders and showed an incidence of about 1 in 100 for fatalities; cholecystectomy showed an incidence of 1 in 500; hysterectomy, 1 in 600; hernia and appendectomy, 1 in 1,300.

Two peaks of fatal embolism were noted; namely, the sixth and eleventh days. This would correspond to the time of getting the patients up to go home at the end of 1 or 2 weeks, respectively. The authors believe that early ambulation may change this figure.

The clinical symptoms and signs are chest pain, more common in the right side—the ratio of pain on the right side to that on the left being 5 to 3. Hemoptysis, physical findings, and roentgenographic signs were each present in about half the cases. A friction rub was present in a third of the cases, and an effusion was demonstrated roentgenologically or by thoracentesis in a fifth of the cases.

One-half of the patients died in 10 minutes; three-fourths died in less than one-half hour, and 10 per cent of the patients lived for more than an hour, so that theoretically it would have been possible to operate upon a fourth of the patients, provided the circumstances were ideal.

The use of heparin and dicumarol is considered. Should these substances be given as a preventive to such large numbers of patients and, if so, what about the hemorrhagic complications? The authors believe that watching for local signs of thrombosis in the legs, and the early performance of femoral vein ligation may be of value. Vein ligation was carried out in many of their cases, but these cases were not included in the present series because they had no emboli. The authors believe that early ambulation offers the most promise as a preventive measure.

BYFORD F. HESKETT, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Slaughter, W. B., and Wong, W.: The Early Management of Facial Injuries. *Surg. Clin. N. America*, 1946, 26: 2.

Since the early care of facial injuries is of great importance cosmetically, functionally, and psychologically, the excuse that other body injuries prevent adequate care is not excusable. With good clinical judgment, much can be done without endangering the patient's general condition.

Once clinical evaluation of the total body injury has been made, treatment instituted as indicated, and the immediate emergency is over, the facial injuries should be considered. A thorough physical examination of the face should be made. For ease and completeness a set routine should be followed

The soft tissue injuries are usually readily apparent but should be noted carefully. It should be remembered that the swelling of these tissues may readily obscure the underlying bone defects.

Examination of the bony structures is best done bimanually, with gentle comparison of the two sides of the face. First the frontal area is examined, then the supraorbital ridges and the zygoma. The eyeball should be observed closely and an ophthalmologist called if necessary. The nasal bones are palpated for symmetry and to elicit motion or crepitus. The close association of the nasal bones with the maxillae, the frontal, lacrimal, and ethmoid bones, and the frequency of extensive associated fractures should be borne in mind. The nose should be examined intranasally for displacement of the cartilaginous portions. Examination of the maxillae should include palpation of the alveolar ridge and study of the occlusion of the teeth. Displacement of the orbital contents should be looked for. The mandible is examined in much the same way. X-ray studies are then made to confirm and localize whatever changes have been found.

Treatment may be immediate, delayed, or late in facial injuries. The immediate, which includes management of shock, control of hemorrhage, relief of pain, and splinting of parts, is the service which offers the patient maximum benefit, and the best possible treatment is therefore mandatory.

Primary suture is desirable and may be done within 4 hours in dirty wounds, and 6 hours in clean wounds. However, the adequate use of sulfonamides

and penicillin may make it possible to shade these arbitrary figures so much that wounds of several days' duration in the soft tissues may be closed primarily. The abundant supply of blood and the local tissue immunity of the face make for better wound healing than in other parts of the body.

Wounds are cleansed by the gentle use of a mild, nonirritating soap and frequent irrigations with normal salt solution or sterile water. At least from 5 to 8 minutes should be used for scrubbing away the debris and loose tissues in the wound. Until proper cleansing can be done, clean or sterile dressings are placed over the wound. Usually ordinary sedation is sufficient, but a general anesthetic should be used if necessary.

Abrasions are the most common facial injury. Dirt and debris ground into the wound must be removed. An oil solvent may be used and a pointed instrument may be resorted to, to remove individual particles.

Lacerations about the face need special care because a cosmetic as well as functional result must be obtained. A stellate laceration, common over the forehead, is best treated by excision of the fragmented edges undermining the wound and suture in a single line. Attention should be given to the lines of Langer. To minimize scar formation all tension must be removed from the skin edges. Adequate undermining and interrupted buried tension sutures are used. The author describes special sutures used to achieve these results. Skin sutures are removed in from 21 to 48 hours, and a firm dressing is applied to aid in splinting the wound. Lid lacerations should be repaired with great care to prevent notching, cicatricial ectropion, and subsequent damage to the eyeball. The conjuctiva and the skin are sutured separately. The tarsus should be brought together accurately. Lacerations about the nose must be repaired with careful attention to symmetry. Lacerations about the tip of the nose should not be sutured heavily as the blood supply is easily interrupted. Lacerations of the lip call for buried tension sutures and accurate matching of the mucocutaneous line of each side. Lacerations of the tongue heal readily and a minimum number of interrupted silk sutures are used for approximation. Ear lacerations are usually difficult to repair. The cartilage must be in accurate apposition so a terraced effect does not result. It is usually not wise to trim fragmented or semimacerated skin for fear of the resulting insufficiency of skin to cover the cartilage. The skin is carefully sutured and then a mold of the posterior surface is formed and pressure applied to prevent a hematoma. The danger of ischemia should be remembered. Local anesthesia with infiltrated novocain may be used although early suture can sometimes be done without anesthesia.

Fractures of the facial bones should be treated after more serious injuries have been taken care of. While the earlier these fractures are treated the less likely complications are apt to occur, 48 or more hours may ensue. The co-operation of neurosurgeons, otorhinologists, and oral surgeons may be advisable in severe fractures.

Depressed fractures of the frontal bone with involvement of the inner plate and symptoms of compression call for a neurosurgeon. Replacement of depressed fragments of the outer table only can be done if not too difficult, otherwise the wound may be allowed to heal and the defect filled later with autografts of bone or cartilage.

Marked disfiguring facial asymmetry results from depressed fractures of the zygomatic bone. Usually elevation, by one of several methods, of the depressed fragment is sufficient, although in some cases open reduction and fixation of the zygoma to the frontal bone with wire will be necessary.

Depression and lateral displacement is the usual accompaniment of fracture of the nasal bones. With cocaine anesthesia given intranasally and novocaine subcutaneously over the bridge, elevation of the depressed fragment and manipulation to proper alignment can be done. Intranasal and extranasal splinting is done, the intranasal splint being removed between 48 and 72 hours; the extranasal splint may be left on for a week. In severely compounded depressed fractures, for which externally molded splints are not feasible, an attachment to a headcap appliance may be necessary to hold the depressed fragment in position. If such treatment is unavailable or the result unsatisfactory, a rhinoplastic procedure may be done later.

Maxillary fractures vary greatly in extent and severity. Mechanical ingenuity is greatly needed in contriving fixation. Each case must be studied on its merits and if the mechanics of the fracture are understood, the treatment will be evident. Packing of the maxillary sinus for several days may be necessary to hold communited depressed fragments in position. If severely impacted fractures are not readily loosened, traction over properly constructed arch bars must be done. After reduction, fixation can be accomplished by wiring of the teeth of the maxilla to the normal mandible, proper occlusion being the guide to satisfactory reduction. In downward displacement of the maxilla, the Federspiel or any similar method may be used with a plaster headcap and traction exerted in the direction necessary for the best correction. This is followed by maintenance of the reduction by external fixation.

Mandibular fractures are the most common of facial fractures. Because of the anatomic structure, fracture from force may occur on the opposite side as well as at the site of application of the force. Common sites in order of frequency are: (1) region of the angle; (2) the mental foramen, (3) the molar region, (4) the symphysis, (5) the condyle, and (6) the coronoid region. Reduction of the fracture and maintenance of normal occlusion, while not hindering swallowing or obstructing breathing, is done by wiring of the teeth, external skeletal fixation, or especially made dental splints. Since these fractures are almost always compounded through a tooth socket or into the mouth itself, early fixation to

avoid infection is imperative. Abscesses should be drained extraorally when indicated.

Alveolar process fractures occur in children and young adults. Any fragment with attachment to soft tissue should be saved. Fixation to adjacent teeth is necessary for stabilization.

After functional results are obtained, plastic procedures for cosmetic and psychological considerations may be considered. Lengthy operative procedures offering but slight improvement in the end should be avoided. In such cases, facial prosthetics should be considered. Wide disfiguring scars may be excised and replaced by a hairline scar if principles mentioned earlier in suturing are adhered to. Contracting scars causing ectropion of the eyelids and lips, and distortion of the nares may be corrected by the Z-plastic procedure. Full thickness grafts, pedicled grafts, cartilage, or bone may be considered in the late cosmetic correction of facial deformity.

EARL H. KLABUNDE, M.D.

Genes, S. G., Dinerstein, Z. M., Scheinerman, M. D., Baf, M. I., and Others: The Treatment of Wounds with Acidophil Paste and Acidophil Serum. *Vrachebnoe Delo*, 1945, p. 59.

The authors used acidophil serum and paste in the treatment of 27 patients with poorly granulating wounds caused by missiles or shrapnels, 10 with osteomyelitis, 34 with frostbites, and 1 patient with a burn. As a rule, the paste was applied daily. The treatment was supplemented by the administration of from 100 to 120 mgm. of ascorbic acid. Only such wounds with poor granulations were treated which did not show any improvement after the customary therapy with naphthalan, chloramine, potassium permanganate solution, cod liver oil, hypertonic saline solution, brilliant green, methylene blue, quartz lamp irradiation, blood transfusions, and skin transplantations. After the first 3 days of treatment with acidophil paste the necrotic tissue began to disappear and the number of pathogenic microorganisms, such as the streptococcus, staphylococcus and bacillus pyocyaneus, began to diminish. The odor subsided and gradually the granulation tissue became brighter. In the majority of cases the wounds healed in from 1 to 3 months although previous treatment with other methods continued for 12 or 15 months had failed. Failure was recorded in only 3 of 27 patients.

The results were less spectacular in frostbites if the treatment was instituted more than 6 months after necrotomy. However, if the treatment was instituted a few days after the necrotomy, extensive wounds healed in 1 or 2 months.

Osteomyelitis was treated with acidophil serum injected daily through the fistulous ducts. Considerable improvement or complete cure followed.

The treatment failed in 1 case of a burn, 5 cases of osteomyelitis, and 2 cases of slowly granulating wounds.

The burning sensation after the application of the paste usually disappears after the first 3 or 4 days of treatment. Occasionally, small ulcers appear in the scar tissue, but they heal promptly. Sometimes the introduction of acidophil serum into a fistula is followed by a chill, rise in temperature, and malaise, but the symptoms disappear after 1 or 2 days. The beneficial effect of the treatment is attributed by the authors to the creation of an acid medium which interferes with the multiplication of the majority of the pathogenic micro-organisms. Furthermore, lactic acid causes a vasodilatation in the wound, with a resulting hyperemia and intensification of the phagocytic properties of the leucocytes. The presence of casein in the paste contributes to the dessication of the wound, and the presence of fat prevents adhesion of the gauze to the tissues and softens the scar. Finally, there is the possibility of a local effect of vitamins A, D, and C on the wound.

The paste and the serum are prepared from lactic acid.

JOSEPH K. NARAT, M.D.

Palladin, A. V.: The Synthetic Production of Vitamin K and Its Use in Hemorrhages and the Treatment of Wounds. *Vrachebnoe Delo*, 1945, p. 9.

Vitamin K formed by plants, vitamin K_2 formed by bacteria, and synthetic vitamin K_3 (methylnaphthoquinone) are usually employed in the presence of hypoprothrombinemia, e.g., for hemorrhages accompanying septicemia, peptic ulcer, and typhoid fever, and also for the hemorrhagic diathesis of infants.

Biochemical research by the author convinced him that synthetic vitamin K products are able to stop parenchymatous hemorrhages resulting from war injuries, surgical operations, or pathological conditions accompanied by vascular disturbances. Such synthetic products are effective no matter whether the amount of prothrombin in the blood is normal or diminished. The author studied 2 synthetic products, namely, methylnaphthoquinone, or vitamin K_3, and a water soluble product which he developed and called "vicasol." The first mentioned product is a yellow greenish powder, poorly soluble in water but easily soluble in 96 per cent alcohol and oil. From 10 to 15 mgm. of the product were given to the patient orally in the form of an alcoholic solution. This daily dose was repeated for 3 to 5 days in succession. The formula of vicasol is $C_{11}H_9O_5SN_3$ and the product appears in the form of a white crystalline powder soluble in water. It has a bitter taste, does not irritate mucous membranes, is stable, and is not decomposed by light. Vicasol was given orally in the form of tablets containing 15 mgm. of the active substance. One tablet was given daily for 4 or 5 days in succession.

Both products eliminate hypoprothrombinemia and cause a restitution of the normal blood clotting. Moreover, both products are able to stop hemorrhages from granulating wounds and lung injuries. The products proved effective also in stopping hemorrhages after tonsillectomies, arthrotomies, and stomatological operations.

Prophylactic administration of either product for 2 or 3 days before the operation diminishes the danger of hemorrhage after tonsillectomy. Good results were observed also after the administration of either product following surgical procedures necessitated by osteomyelitis of the upper jaw, and following war injuries. Hemorrhage during and after the operation was considerably diminished following the prophylactic use of the drugs, which also obviated the necessity of placing sponges in the maxillary sinus for the purpose of hemostasis.

The drugs are rendering good service after tooth extractions.

Both products proved efficient in stopping hemorrhages from hemorrhoids or the nose. Also, bleeding caused by pulmonary tuberculosis could be controlled by either product. Similar results were obtained in the treatment of parenchymatous gynecologic hemorrhage following endometritis, inflammatory processes in the adnexa, and also juvenile and preclimateric hemorrhages. Bleeding attributable to scurvy could be promptly stopped by either product. The healing process in superficial wounds could be accelerated by vicasol or methyl naphthoquinone.

The author's observation led him to the conclusion that the original theory concerning the mechanism of the physiologic action of vitamin K is incorrect because the vitamin or its substitutes are effective also in conditions not accompanied by hypoprothrombinemia. JOSEPH K. NARAT, M.D.

Wells, D. B., Root, M. T., Kendall, R. E., and Leonard, J. C.: A Symposium on Burns from the Hartford Circus Disaster. *Occup. M.*, 1946, 1: 99.

The reports presented in this symposium teach a number of significant lessons in the treatment of burns.

The Hartford circus disaster, which involved the life and health of a considerable number of people, demonstrated the importance of constant preparedness for such civilian catastrophies. In large part, the favorable results obtained in the management of this group of burned patients came from wise preparation that had been made previously and that involved specific organization of the community and hospitals. The adequate staff, aides, facilities, and supplies readily available paid large dividends and made possible the prompt exhibition of modern methods.

A Burn Committee had previously developed a plan of action for the Hartford Hospital. This committee sprung into action at the time of the fire and its recommended procedures were applied almost immediately. Remarkably favorable physical and emotional responses resulted from the mass method of handling this group of seriously ill and psychically traumatized people.

From the point of view of the laboratory in the management of burns, estimations of the hemoconcentration, for the purpose of determining the degree of shock, are essential for early function. The authors improvised a setup for securing the specific gravities by the copper sulfate falling drop technique; this was found to be of assistance in directing the use of plasma, transfusion of whole blood, and nutritional therapy.

In the author's experience, this method offered a simple, rapid, and reliable guide to the hemoconcentration in burn shock. DAVID H. LYNN, M.D.

Walker, J. Jr., Saltonstall, H., Rhoads, J. E., and Lee, W. E.: Toxemia Syndrome after Burns; Biochemical and Pathological Observations and Studies. *Arch. Surg.*, 1946, 52: 177.

Patients who have sustained severe extensive burns exhibit two reactions to their injuries—shock and toxemia. At one time it was thought that the two were one process, but it is possible to distinguish between them. Shock, occurring very shortly after the burn has been sustained, and ending usually within the first 24 hours, is marked by hemoconcentration, hypotension, tachycardia, and cold extremities; on the other hand, toxemia, appearing on the second day and usually lasting 3 or 4 days, is marked by headache, vomiting, fever, oliguria, disorientation, myoclonus, and some evidence of renal and hepatic dysfunction.

Severely burned patients admitted to the Pennsylvania Hospital, and to other Philadelphia hospitals, have been studied for signs of burn toxemia. The quantitative van den Bergh test demonstrated some hepatic damage, which was much more marked when tannic acid or some other tanning agent was applied to the burned areas than when petrolatum and pressure dressings were used. However, avoidance of tanning agents seemed to have little effect on the mortality in burn cases. Renal damage was estimated by studies of the urine and elevation of the plasma nonprotein nitrogen. All patients had some elevation. Of the 10 patients who had a level of over 100 mgm. per hundred cubic centimeters of plasma, 9 died. An "undetermined" nitrogen, the residue unaccounted for after determination of the urea, uric acid, creatinine, and alpha amino nitrogen fractions, was found to represent from 60 to 80 per cent of the rise in nonprotein nitrogen in the toxemic patient and served as a useful index of the presence and severity of toxemia during the first week after the burn.

Pathological studies were made of the organs of patients who died in from 2 to 6 days after the burn, in what was clinically burn toxemia. The livers showed fatty infiltration but no actual necrosis. The kidneys showed rather pronounced toxic nephrosis with degeneration of entire tubules. In the adrenals there was no gross hemorrhage, but the inner zone of the cortex showed edema and degeneration. Gross examination of the brains showed edema and some herniation of the cerebellar tonsils through the foramen magnum with consequent compression of the medulla oblongata. Microscopic sections showed general toxic degeneration of ganglion cells,

most evident in the cortex and the hypothalamus. In general, the bodies of these patients were edematous and flabby, and the edema seemed unrelated to the amount of fluid administered therapeutically to the patient. The tissues having a high consumption of oxygen seemed to have sustained the greatest damage.

In conclusion, the authors stress the importance of the disproportionate rise in "undetermined" nitrogen, which cannot be entirely explained on the basis of renal damage. Although some deaths from burns are the result of overwhelming kidney damage, still others appear to result from damage to the central nervous system. The process of burn toxemia is a widespread one, for which no specific treatment is yet known. B. F. LOUNSBURY, M.D.

Gerber, I. E., Schwartzman, G., and Baehr, G.: The Penetration of Penicillin into Foci of Infection. *J. Am. M. Ass.*, 1946, 130: 761.

Intermittent intramuscular injections of large doses of penicillin at 3 hour intervals seem in general to be more effective in the control of bacteriemia and of local infections than continuous intravenous administration of the same total daily amount.

The intramuscular administration of penicillin in divided doses has the distinct advantage of producing a higher peak level in the blood intermittently throughout the day, and thereby favors the penetration of penicillin into vegetations of acute and subacute bacterial endocarditis and into suppurative thrombophlebitis or other primary sites of bacteriemia.

To assure the penetration of adequate amounts of penicillin into primary foci responsible for bacteriemia (i.e., vegetations, thrombophlebitis), additional massive "booster doses" several times a day are often desirable. Such "booster doses" should be five or six times the routine intramuscular dosage which has produced blood levels sufficient to clear the blood of bacteria.

Subacute bacterial endocarditis and other chronic infections due to organisms of relatively high penicillin resistance are more advantageously treated with massive doses at frequent intervals throughout the day (every 3 hours). The minimum duration of therapy should be 5 weeks.

In purely localized infections with highly resistant organisms, such as actinomyces, penicillin is best concentrated in a few massive intramuscular doses each day in order to favor penetration by means of exceptionally high peak levels, and, if possible, also administered directly into the infected area.

CHARLES BARON, M.D.

Trumper, M., and Thompson, G. J.: Chilling Penicillin. *J. Am. Med. Ass.*, 1946, 130: 627.

The present study was undertaken with a view to finding some method of obviating the need for the injection of penicillin every few hours. The authors state that effective blood levels can be obtained by chilling the site of the injection.

Patients with gonorrhea were studied. An ice bag of 80 ounce capacity, filled with crushed ice, was placed about the upper shoulder, fastened by a supporting harness, for a period of 2 hours, following which chilled penicillin (100,000 units in a 10 c.c. solution) was slowly injected into the deltoid muscle. The ice bag was then replaced for a period of 12 hours, refilling it as necessary. Cure of the gonorrhea and negative smears were obtained with the use of this method in 91 per cent of the cases. However, with higher doses, i.e., 150,000 units of penicillin, a 95 per cent cure should be expected.

The method used compares favorably with results reported following the use of multiple injections, or single injections of penicillin in beeswax and peanut oil.

The chilling method not only reduced, to one, the number of injections required for treatment of uncomplicated gonorrhea, but also rendered the injection painless, and made the injection of any other foreign substance unnecessary.

ARTHUR J. LESSER, M.D.

Hamilton, J. E., Prandoni, A. G., Evans, J. M., and Romansky, M. J.: Penicillin Therapy of Infections in 220 Patients. *Surgery*, 1946, 19: 186.

The Penicillin Committee at Walter Reed General Hospital, Washington, D. C., reports the use of the drug in 255 conditions in 220 patients from July, 1943 to September, 1944. Attention was directed toward large dosage rather than minimal dosage, varying from 90,000 units a day in the susceptible gonococcal, streptococcal, and pneumococcal infections, to 500,000 units a day in the more resistant staphylococcal, anerobic clostridial, and actinomycetic infections.

Complications due to the penicillin therapy were minimal, urticaria being the most common. In no instance of 13 cases of carbuncle and furuncle was it necessary to incise and drain the infection. Among 20 cases of cellulitis and abscess of the soft tissue in general, 5 responded to penicillin which did not respond to sulfonamides. The drug was used in extensive clean or in contaminated operative cases as an adjunct to surgical procedures and was found to be of indisputable value. In skin grafting and primary closure of pilonidal sinus excision wounds its value is still to be proved.

Sequestration was prevented in 4 cases of acute osteomyelitis and an increased dosage of penicillin was suggested in all early cases. One case of penicillin cure in a patient with a brain abscess secondary to lung abscess was unique. In empyema the drug was found useful in controlling early systemic infection or accompanying pneumonia, but if pus continued to form from the tenth to the fourteenth day after penicillin had been given intramuscularly and intrapleurally, rib resection was advised and performed.

In lung abscess without lobectomy, it is the author's opinion that penicillin is vastly superior to the sulfonamides and in the great majority of the

cases the early abscess will yield to the drug. Four cases of lobectomy for lung abscess were reported. All of the patients developed a postoperative putrid empyema but all recovered.

The drug was used in a variety of medical diseases. In the actinomycetic infections there would appear to be a wide variability in susceptibility to the drug. Appraisal of its efficacy in brucellosis is withheld.

E. A. GORVETT, M.D.

Barber, M., Nellen, M., and Zoob, M.: Erysipeloid of Rosenbach: Response to Penicillin. *Lancet*, Lond., 1946, 1: 125.

Human infection with erysipelothrix rhusiopathiae, the organism of swine erysipelas, is sufficiently uncommon for any proved case to be worth recording. Recently, 7 patients with clinically diagnosed erysipeloid of Rosenbach were admitted to the hospital, and in 5 of them the diagnosis has been bacteriologically confirmed. These cases are believed to be the first in humans to be treated with penicillin, although Heilman and Herrell (1944) have successfully treated experimental erysipelothrix infection in mice with penicillin.

Of the 5 cases of bacteriologically confirmed erysipeloid of Rosenbach reported, 3 were treated with penicillin intramuscularly, which appeared to effect a complete recovery in 48 hours. These 5 cases and 2 other clinically similar ones were all admitted within a period of 4 months.

BENJAMIN GOLDMAN, M.D.

North, E. A., and Christie, R.: Acquired Resistance of Staphylococci to the Action of Penicillin. *Med. J. Australia*, 1946, 1: 176.

After testing more than 100 strains of staphylococci, Spink, Hall, and Ferris, in 1945, failed to find a single strain not previously exposed to penicillin that was not inhibited by 1 unit of penicillin per cubic centimeter. The authors, also, believe that naturally occurring penicillin-resistant staphylococci are rare. However, a large number of strains isolated from patients receiving penicillin show considerable resistance to this drug by the standard sensitivity tests. Up to this time there was no evidence to indicate whether the resistant strains were descendants of sensitive organisms already in the wound, or contaminants with naturally resistant strains or strains which had acquired resistance and become disseminated through the wards.

The authors have isolated some penicillin-resistant staphylococci which are without doubt variants of sensitive parent organisms which acquired resistance to penicillin in vitro.

When the parent penicillin-sensitive strain of staphylococci was compared with the penicillin-resistant strain, which had developed in vivo, by the mouse pathogenicity test, it was found that their killing power was identical within the limits of experimental error.

Next, the ability of penicillin to prevent death in mice was investigated. It was found that penicillin saved the mice infected with a penicillin-sensitive strain, while similar treatment failed to save the mice infected with penicillin-resistant staphylococci. This experiment is of more value because the resistant organism is almost certainly a direct descendant of the sensitive strain. This is assumed because of the rarity of the strain, and the similarity between the coagulase formation, fibrinolysis, hemolysis, pigment formation, and serological typing of the strains.

The penicillin-resistant strain developed in vitro differed considerably from the parent strain in biological and metabolic characteristics. However, numerous subcultures on nutrient broth caused this strain to resume the characteristics of the parent strain, including its sensitivity to penicillin. When the killing doses of these organisms were investigated, the penicillin-resistant strain developed in vitro was almost completely avirulent while its parent strain killed mice to the same extent as the strains investigated in the first part of the experiment.

When a rabbit was injected with a penicillin-resistant strain developed in vitro it suffered no ill effects. The organism was recovered once from the blood stream and still found to be resistant to the same amount of penicillin. When the parent strain was injected, the rabbit died.

The authors in 2 different experiments confirmed the findings of Spink, Hall, and Ferris (1945)—that a penicillin inhibitor can be extracted from staphylococci that have acquired resistance in vivo, but not from resistant variants developed in vitro.

The results of these experiments seem to support the theory that resistance to penicillin developed in vitro is only temporary, while resistance acquired in vivo as a result of penicillin therapy is more permanent. These organisms also seem to retain their full pathogenicity.

So far there is little evidence to support the idea that these resistant strains developed in vivo have been a major cause of the failure of penicillin therapy. The authors subcultured for 30 days 6 resistant strains obtained from infected wounds without altering their resistance to penicillin, their invasiveness, and their pathogenicity. One strain was passed through animals three times and its resistance to penicillin was unchanged. The authors' work confirmed the findings of Warmer and Amluxen to the effect that certain penicillin-resistant strains were as resistant to concentrations of penicillin in vivo as to those in vitro.

In the light of recent evidence in the literature and the authors' experience, it is likely that penicillin-resistant staphylococci may become a clinical problem in the future. ROBERT R. BIGELOW, M.D.

Foshay, L., and Pasternack, A. B.: Streptomycin for Tularemia. *J. Am. M. Ass.*, 1946, 130: 393.

It is noteworthy that each of the first 6 patients given streptomycin for tularemia experienced relief from the distressing general symptoms of headache, mental dullness, the sense of prostration, arthralgia,

myalgia, chills or chilly sensations, and nausea before the end of the first day of therapy. This effect was a striking feature by the end of the second day, and it appeared even with very low, possibly suboptimal, dosage. The authors infer that bacteriostasis, which must undoubtedly have occurred within the first 12 hours of therapy, is associated with failure of the bacteria to elaborate the diffusible substances that lead to the production of these symptoms. Failure of papular primary lesions to ulcerate, even after incision, seems also a result of bacteriostasis or a regional bactericidal effect.

It is probable that the authors gave too little streptomycin, or gave it for too short a period, to obtain the best possible results in several cases.

Administration by continuous subcutaneous drip, which seems to be tolerated better than continuous intravenous drip, would have been more effective than intermittent intramuscular administration in securing high initial blood and tissue concentrations, the most important factors for successful therapy with all bacteriostatic and bactericidal agents.

The authors were unable to determine streptomycin concentrations in the blood or serum at the time these patients were treated. From later studies they infer that the administration of 30,000 units every 3 hours maintained concentrations between 2 and 4 units per cubic centimeter of serum during the period of administration.

Comparison with serum therapy. Comparative estimates of the effects of these therapeutic agents were unavoidable. With due regard for the small size of the streptomycin series, one feature was outstanding: the uniformity of the clinical responses in character, degree, continuity, and time of appearance. Although the authors have records of serum treated patients that compare favorably with the cases recorded here, these cases could not be matched by any 7 case records of the serum treated patients selected at random.

The responses to serum therapy have always shown a wide range of variability in character, degree, continuity of effect, and time of appearance. This has been attributed chiefly to variability in the efficiency of individual defense mechanisms as they were aided by a bacteriostatic agent. The administration of a bactericidal agent that acts directly on bacteria and independently of the variable, individual defense mechanism possibly accounts for the observed uniformity of the reponses to streptomycin.

JOHN J. MALONEY, M.D.

Miller, C. P., and Bohnhoff, M.: Streptomycin Resistant Cocci. *J. Am. M. Ass.*, 1946, 130: 485.

Drug resistance or "fastness," that is, the acquisition by micro-organisms of tolerance for chemotherapeutic agents, has long engaged the attention of bacteriologists and parasitologists and has recently become a matter of concern among clinicians and epidemiologists. Resistant strains of micro-organisms usually susceptible to the sulfonamides have been recognized for some time, and penicillin resistant strains are now beginning to appear in the clinic and laboratory. The apprehension which might have been caused by the latter is currently being allayed by the introduction of streptomycin.

It should be pointed out that the observations have been made on micro-organisms which have been rendered drug resistant by artificial means, and that these findings must not be assumed to apply by analogy to naturally resistant strains if and when they arise. The relation of artificially acquired and naturally acquired resistance to chemotherapeutic agents involves many questions as yet unanswered.

Repeated cultivation of gonococci and meningococci on mediums containing increasing concentrations of streptomycin enhanced their streptomycin resistance rapidly—within 4 to 6 transfers—to such a degree that growth occurred on concentrations of 75,000 units per cubic centimeter, the highest concentration employed. These streptomycin resistant meningococci remained fully virulent for mice and produced lethal infections with generalized sepsis in spite of treatment with 15,000 units of streptomycin, the maximum dosage tolerated by the animals. Similar infections with the same strains before they had become resistant were regularly cured by doses of from 70 to 100 units of streptomycin.

Streptomycin resistant meningococci were susceptible in vitro and in vivo to penicillin, and penicillin resistant meningococci were susceptible to streptomycin in vitro and in vivo.

Gonococci resistant to either drug were susceptible to the other in vitro.

Streptomycin resistant micro-organisms did not show the gross and microscopic abnormalities observed in penicillin resistant strains.

It is concluded that the mode of action of streptomycin on these micro-organisms differs from that of penicillin.

JOHN E. KIRKPATRICK, M.D.

Weinstein, L.: Typhoid Bacillus Infection of a Surgical Wound; Treatment with a Urethane-Sulfanilamide Mixture. *N. England. J. M.*, 1946, 234: 184.

In spite of the fact that a moderate number of patients with typhoid fever develop complications requiring operative intervention, such as incision and drainage for osteomyelitis or laparotomy for intestinal hemorrhage or perforation, and that the eberthella typhosa is capable of producing localized areas of infection, there is a scarcity of reports concerning suppurative complications of surgical wounds.

The author reports a case of typhoid bacillus infection in a surgical wound of the leg, without underlying osteomyelitis or periostitis, in a patient who probably had an undetected mild attack of typhoid fever several weeks prior to operation for the open reduction of a fracture of the femur. Had the patient not incurred a fracture of the hip, with subsequent infection of the operative wound by the typhoid bacillus, the diagnosis of typhoid fever would in all probability never have been made.

The manner in which the enteric pathogenic bacteria gained entrance to the wound is open to conjecture. It seems probable that the organisms were not brought to the site of operation by the blood stream, since, if it is assumed that the original illness 3 weeks previously was typhoid fever, the bacteriemic stage should have been over for an appreciable time.

It has been demonstrated that the eberthella typhosa is extremely susceptible to the action of urethane.

Treatment of the local infection with a solution containing 10 per cent urethane and 1 per cent sulfanilamide led to rapid eradication of the infecting bacteria and healing of the wound.

The importance of localized areas of suppuration due to the eberthella typhosa cannot be overemphasized because, unless promptly recognized bacteriologically and the necessary precautions taken, spread of typhoid fever may occur.

HARRY W. FINK, M.D.

Boyd, J. S. K.: Tetanus in the African and European Theaters of War from 1939 to 1945. *Lancet*, Lond., 1946, 1: 113.

The object of this report is to assess the incidence of tetanus in the European and African campaigns of 1939–45; to ascertain as far as possible the extent to which this has been influenced by active and passive immunization; to examine the effect of immunization on the severity of the disease; to discuss the failure of active immunization in preventing the development of tetanus in certain cases; and to consider the results of various forms of treatment and other matters of lesser importance.

The report is based on the records of 103 cases of tetanus in British, Indian, Dominion, and Colonial land forces, in a few Allied troops, and in prisoners of war during military operations in the European and African theaters of war. Most of the patients were battle casualties. Passive immunization against tetanus by inoculation with tetanus antitoxin was used for the first time on a large scale in the war of 1914–18, and its value as a prophylactic measure was fully tested and proved.

It was found that 2 doses of 1 cubic centimeter of a potent toxoid, given at an interval of 6 weeks, produced in most cases a level of circulating antitoxin believed to be adequate to afford temporary protection, and at the same time called into permanent existence a defensive mechanism capable, when stimulated by the presence of further quantities of toxoid (and presumably toxin), of turning out large quantities of antitoxin. Subsequent doses of toxoid produced both a higher level of circulating antitoxin and a more sensitive and more readily stimulated defensive mechanism.

Active immunization against tetanus by means of 2 doses of 1 cubic centimeter of tetanus toxoid given at an interval of 6 weeks was officially introduced into the British Army in 1938, and it is estimated that at the time of the German invasion of Belgium and France, when the first heavy casualties were incurred, about 90 per cent of the troops on the Continent were protected. Although the advantage of a third dose was fully realized, this was not made a standard procedure until January, 1941, mainly owing to difficulties in procuring the necessary supplies of toxoid. In the Middle East (the theater in which most casualties were being incurred at that time) this order took long to implement, because of the inevitable delay, through transport shortage, in getting supplies from home. Finally, in November, 1942, instructions were issued for an annual "boosting" dose of 1 cubic centimeter of toxoid to be given to all Service personnel. Before the invasion of Europe, the troops in 21 Army groups were practically 100 per cent inoculated. As an additional precautionary measure, a special order was issued, which required that every man who had not already received one or more boosting doses—i.e., every man who had received only the initial 2 doses—should be given a third dose before going overseas. A few managed to elude the net, but their number was small.

Passive immunization was maintained as an additional precaution. Any wounded man who was not actively immunized was given 3 doses of 3,000 international units of antitoxin at weekly intervals. Actively immunized men were given a single dose of 3,000 units as soon as possible after wounding. The object of this dose was to tide the man over the first critical week, during which his circulating antitoxin might be below the safety level. This procedure of combined active and passive immunization was adopted in the United Kingdom, and in the Australian, New Zealand, and Indian armies. In South African troops (U.D.F.) passive immunization alone was used until 1942. In the Canadian and American Army forces, the troops were actively immunized in the same way as in the British Army; however, when wounded they were given, not antitoxin, but a further boosting dose of 1 cubic centimeter of tetanus toxoid, with the object of stimulating rapid antitoxin production.

An analysis of this study indicates that the incidence of tetanus in the African and European campaigns has been negligible. This is attributable chiefly to active immunization with tetanus toxoid.

Active immunization did not prevent the development of tetanus in 22 cases. The case-mortality rate among actively immunized men did not fall below the average, but it is noteworthy that the majority of fatal cases were in colored troops.

The case mortality rate in actively immunized men who were given prophylactic antitoxin was significantly lowered.

The duration of the symptoms in actively immunized men who survived was also significantly lowered.

The incubation period in actively immunized men rarely exceeded 10 days, whereas in most of those who were not actively immunized, the incubation period was more than 10 days.

Failure of active immunization appears to be attributable to an inadequate level of circulating

antitoxin in the early stages of infection and is more likely to be remedied by prophylactic antitoxin than by a "booster" dose of toxoid.

Therapeutic antitoxin, to be effective, must be given early in large doses by the intravenous route.

Sedatives, including avertin and penthothal, did not influence the course of the disease, although they were effective in relieving symptoms.

BENJAMIN GOLDMAN, M.D.

ANESTHESIA

Waters, R. M.: Anesthesiology. *J. Am. M. Ass.*, 1946, 130: 909.

Certain abuses associated with anesthesiology are common and accepted practices in our country. Exploitation of the patient by the hospital or anesthetist does exist. And often the qualified medical specialist in anesthesia has not the recognition, as a professional member of the medical staff, that he is entitled to. There is often domination of this department by hospital executives or others whose vision of the ideal is blurred by the desire to avoid entries on the debit side of the ledger. It is important to avoid exploitation, and to be sure that sufficient funds are set aside or collected to pay adequately for good service in anesthesiology.

Several organizations of anesthesia service are suggested; the scope of departmental organization and the size of the institution will determine the number of individuals needed. Of importance are the teaching and research possibilities of the specialty. These should be given proper emphasis. Much wasted effort in unnecessary experimentation can be avoided by interdepartmental friendship and understanding throughout the medical school and hospital.

The public as a whole is not receiving the best service that anesthesiology is capable of supplying. This is probably due to the insufficient number of anesthesiologists available. This deficiency is due to a variety of abuses which have become common practice in the hospitals of this country. Proper instruction of undergraduate and graduate students in our medical schools and hospitals is one method leading to improvement and the other is organization of departments in medical schools and hospitals.

This article is a plea to correct the abuses of this specialty at this auspicious time when hundreds of medical officers interested in anesthesiology are returning from war. MARY KARP, M.D.

Monheim, L. M.: Anesthetic Procedures Used in a General Hospital in the Communication Zone with an Analysis of 2,000 Anesthesias. *Current Res. Anesth.*, 1946, 25: 67.

This is a review of the first 2,000 anesthesias administered in a General Hospital in the Southwest Pacific Theater. Its purpose is to study the technique used and the results obtained, as well as to define the duties of the anesthesiologist.

The anesthetic section has as its duties the establishing of surgical anesthesia, the performance of diagnostic and therapeutic "blocks," and the administration of intravenous fluids in the operating rooms and oxygen therapy throughout the hospital.

Of the 2,000 anesthesias given, 805 (40%) were by regional methods, 856 (42%) were general; 270 (14%) were local infiltrations, and 69 (4%) were given by combined methods. Four hundred and forty seven of the regional cases were spinal anesthesias and gave gratifying results. The effectiveness of spinal analgesia depends upon the knowledge of the various techniques and the proper selection of cases.

Cervical plexus block and brachial plexus block are described in detail, with a discussion of the new technique for brachial plexus injection. This technique is a combination of the technique used by Lundy and McCluskey, plus a few personal innovations. It has been successful in more than 90 per cent of the 74 cases in which it has been used. It involves the use of 3 needles, the first one contacting the first rib at a point half a finger breadth above the clavicle and just lateral to the subclavian artery. The second and third needles are placed 1 and 2 finger breadths, respectively, posterior and slightly lateral to the first needle, neither exceeding the first needle in depth. A total of 50 c.c. of 2 per cent metycaine solution is used for the block. Procaine or metycaine was the drug used for spinal anesthesia. Of the 856 patients who received general anesthesia, 833 were given pentothal intravenously. It was believed that inhalation anesthesia was less suitable for use in the tropics than regional methods. Nineteen different types of combined anesthesias were used for 69 cases. The most frequent combinations were regional anesthesia plus enough pentothal to keep the patient asleep or drowsy.

Complications were kept at a minimum. The immediate complications included laryngeal spasm, which occurred during pentothal anesthesia, and an occasional depression of the respiration. There was only one complication of pneumothorax following regional anesthesia. Postanesthetic headaches occurred in 3 per cent of the spinal cases.

MARY KARP, M.D.

Fraser, R. J.: Continuous Lumbar Anesthesia with the Dilution Technique. *Current Res. Anesth.*, 1946, 25: 58.

This article describes a technique for spinal anesthesia with dilute solutions gained from more than 6 years of experience in 3,000 personal administrations with no anesthetic mortality. Two thousand of these anesthesias were given with the continuous technique. The dilute solutions were used because it was believed that they produced less metabolic change, fewer discomforts, and less morbidity in the patient.

The agents, employed singly or in combination, were procaine, pontocaine, percaine, or dilute nupercaine, and the method with which these agents were used was described in detail. A 1 per cent solution of procaine in saline solution especially prepared for lumbar anesthesia was the drug of choice. With this solution the volume is larger and the interval be-

tween injections is closer than with the concentrated solution of procaine. The second injection was usually required 30 minutes after the initial injection when procaine was used and again 15 to 20 minutes thereafter. As much as 35 c.c. of a 1 per cent solution of procaine has been given in chest surgery at one dose with no respiratory paralysis. The continuous technique offers more safety than the single dose technique, and the dilute technique offers a safer procedure than the concentrated technique since the former has less effect on the respiratory, cardiac, and vasomotor systems. No barbotage was used.

Stress was made on the necessity of maintaining a continuity of the continuous lumbar apparatus. Pressor drugs were not used routinely, but were indicated in aged and hypersensitive patients, and included ephedrine, epinephrine, ephedrine-pitressin combination, neosynephrin, and methedrine.

The technique of combining nupercaine procaine or pontocaine glucose was discussed. When pontocaine and glucose were the agents used, a 0.2/10 solution or 0.1/10 per cent solution was found to have the same anesthetic potency as the 1 per cent procaine solution. So far, no intercostal paralysis has resulted from the more dilute 0.1 per cent solution. The use of dilute nupercaine is still in the experimental stage.

The largest volume of procaine in the series was 60 c.c., and the longest anesthesia reported was 5 hours. MARY KARP, M.D.

Evans, F. T.: Sepsis and Asepsis in Spinal Analgesia. *Proc. R. Soc. M.*, Lond., 1946, 39: 181.

It is the author's opinion that when sepsis occurs in spinal analgesia, the infective material is conveyed through the lumen of the spinal needle because of some avoidable failure in the anesthetist's technique. The author also stresses the question of asepsis.

There are many points at which the technique can break down. Septic matter can enter the spinal canal as the result of spinal puncture as follows:

1. From the hands of the anesthetist
2. From the skin of the lumbar area
3. From the imperfect sterilization of syringes and needles
4. From contamination of the needles and syringes
5. From a hematoma caused by repeated attempts at spinal puncture

The wisest course is to scrub the hands with soap and water as for any surgical procedure, rinse them in alcohol for 2 minutes, and allow them to dry. Furthermore, the use of sterile rubber gloves, put on in the proper manner, is recommended.

With regard to skin preparation, the preferred method is washing with soap and water, this being followed by the application of tincture of iodine and alcohol. Since it is possible for organisms to be carried in by the needle, either on the point or just inside the lumen of the point, the Sise introducer may be used as a precaution.

The syringes and needles are used for nothing but spinal punctures. All-glass syringes are recommended as infected clots or organisms can lodge in the interstices of the cement in other types and it is difficult for the sterilizing fluid to penetrate these areas. The best method of sterilization is with dry heat or autoclaving. If this is not possible, boiling for 5 minutes in water is reasonably safe, distilled water being used to avoid the risk of an alkaline reaction which will precipitate the anesthetic as its insoluble base.

Distilled water employed for rinsing needles and syringes must be taken from a new bottle that has been freshly sterilized, as organisms can be found in the water after the bottle has been opened for a few hours.

Anesthetic solutions in ampoules are safest, but there is a source of infection via the ampoule. This is the paper label, which will float off in aqueous solutions, and the organisms imprisoned under the label are released and thus form a source of infection. Ampoules may be kept in 70 per cent alcohol or their outer surface may be sterilized by immersion in formalin vapor for 24 hours.

There is some evidence of the occurrence of "chemical meningitis," but this is thought to be negligible.

Direct handling of the ampoules is avoided and the needle is introduced into the ampoule without its touching the exterior.

With proper technique, the risk of infection is negligible, but if there is any deviation from this, infection can occur, and sometimes with disastrous consequences. MARY FRANCES POE, M.D.

Griffith, H. R.: The Physiological and Clinical Action of Curare. *Current Res. Anesth.*, 1946, 25: 45.

This article reviews the history of the present knowledge of the clinical use of curare, with special reference to its use in anesthesiology. The curare effect is observed usually within a minute after the injection is made, reaches its peak in about 5 minutes, and then in 20 minutes it gradually disappears. The proper dose depends upon the anesthetic agent which is used, the size and age of the patient, and the individual susceptibility to the drug. When ether is the anesthetic agent used, curare causes more respiratory depression than when it is used as an adjunct to cyclopropane alone. Pentothal does not have the same curariform action as ether, but care must be employed to maintain an adequate respiratory exchange when curare is added to pentothal anesthesia. There is less margin of safety between the effective dose and the overdose in young children than in adults. Frail or seriously ill adults seem to stand the drug as well as robust ones, and need as large a dose in proportion to weight.

The usual initial dose in adults is between 3 and 3½ c.c. Five cubic centimeters is the maximum dose for one injection. Large doses probably bring on the central action of curare rather than the desired peripheral action. Disappointing results follow an attempt to give initial doses smaller than 3 c.c. to

adult patients under cyclopropane or other gas anesthetic agents.

The author has personally administered curare to 700 patients. It is used as an adjunct to cyclopropane in 40 per cent of all abdominal operations. It is useful in facilitating endotracheal intubation in cases in which there is much muscular rigidity, in overcoming the tight anal sphincter in hemorrhoidectomies, in aiding pelvic examinations in obese patients, and in relaxing a conscious muscular patient who is to have a bronchoscopy.

Curare has two actions. The well known peripheral action and the central action on the brain. The peripheral action is due to an interruption of the nerve impulse at the neuromuscular junction, probably a blocking or neutralizing of the acetylcholine reaction. Curare thus prevents the effecter substance of voluntary muscle from reacting to acetylcholine, and also blocks synaptic transmission between preganglionic and postganglionic fibers of the sympathetic division of the autonomic nervous system.

Evidence of the central action of curare is based upon recent clinical results following the administration of large doses to patients and the findings in recent laboratory experiments. When large doses were given, complete paralysis of all skeletal muscles resulted with an abrupt loss of consciousness without any preceding period of analgesia. Evidence points to the independent nature of the central and peripheral actions. Prostigmine was not believed to be a necessary antidote to overdose of the drug.

An occasional bronchial spasm resulted from the use of curare. Among the author's 700 cases, 3 bronchial spasms were observed.

There is no contraindication to its use. It may be administered to any patients in whom extra muscular relaxation is needed. Sternal injection may be used when the veins are inaccessible.

The sure but transitory action, with rapidity of elimination and no after effects, makes the use of curare a great benefit to the anesthetist and appears to give this drug a permanent place in anesthesiology. MARY KARP, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Jenkins, H. P., and Clarke, J. S.: Gelatin Sponge, A New Hemostatic Substance; Studies on Absorbability. *Arch. Surg.*, 1945, 51: 253.

Hemostasis is a fundamental principle in surgical technique. It can be satisfactorily obtained in most instances by ligature, clips, pressure, electrocoagulation, and packs. There are some situations, however, in which venous or capillary bleeding may be difficult to control by these methods.

The major recent advances in the problem of control of capillary and venous oozing have been the development of coagulating agents, such as thrombin, and the use of absorbable substances which will aid in clot formation by purely mechanical means, such as transmitting pressure to the bleeding surface and offering a matrix for the formation of the clot.

The work of Seegers and his coworkers deserves special mention as a major contribution to the problem of hemostasis. They have developed a method of preparing a purified thrombin, which is now commercially available and, furthermore, they have worked out a method of calibration and standardization of the potency of the thrombin known as the Iowa unit.

The most recent of the absorbable hemostatic materials is gelatin sponge or foam. This is prepared from ordinary commercial gelatin, which is made up in a solution to which a hardening agent is added. After bubbles of air are introduced, the mixture is allowed to dry in pans. It can then be cut into any desired size or shape. The material, which has been used for experimental purposes, is provided in sealed glass jars previously subjected to sterilization with dry heat.

The gelatin sponge is a white crisp material which is extremely light in weight. One cubic centimeter weighs 9 mgm. The sponge will take up many times its weight of water when it is submerged and the air bubbles are expressed.

When moistened, the gelatin sponge shrinks and becomes soft and pliable. It easily adjusts itself to any irregularities in the surface to which it is applied. It does not fragment easily, although it is not especially tough.

An experiment was devised primarily to determine the behavior of the gelatin sponge in the tissues of animals and the response of the tissues to the gelatin. To avoid the introduction of an additional factor in this evaluation, the gelatin sponge was used without thrombin.

These experiments have demonstrated that gelatin sponge is a bland substance which is generally slowly absorbed in the tissues over a period of about 5 weeks.

The presence of a conspicuous number of polymorphonuclear leucocytes would generally lead to rapid absorption of the sponge within a few days or a week by a liquefaction process.

The magnitude of the tissue reaction to the gelatin sponge during the period of absorption was generally less than that observed for surgical gut.

Gelatin sponge has a definite hemostatic action per se when applied to bleeding surfaces with moderate pressure.

Gelatin sponge or foam appears to have properties which make it suitable as an absorbable hemostatic substance, and deserves clinical trial in the varied fields of surgery to further evaluate its merits and limitations. JOHN E. KIRKPATRICK, M.D.

Lowry, M. L.: Synthetic Adhesives in the Treatment of Wounds of the Liver and Other Surgical Conditions; A Preliminary Report. *Arch. Surg.*, 1946, 52: 160.

With a view to finding a hemostatic agent capable of controlling hemorrhage from extensive wounds, the author has performed experiments on rabbits, and has used commercial Scotch tape to cover de-

fects left by the excision of segments of the liver. Seventeen animals were operated upon and large wedge-shaped portions of their livers were cut away. No attempt was made to bring the two cut surfaces together or to control the bleeding in any way, nor was the tape applied to the raw surfaces of the liver. Instead it was placed on the upper and lower surfaces of the liver and brought out over the defects to the edge of the liver in such a manner as to enclose completely the area from which the excision had been made. One rabbit died of peritonitis on the fourth day. In contrast to this, 8 of the 11 control animals died of hemorrhage within 12 hours; the 3 control rabbits which survived had the smallest liver wounds.

Commercial Scotch tape consists of three layers: the backing, usually cellophane; the filler, rope stock paper; and the adhesive face, crude rubber or some synthetic substitute. Eleven types of tape were tested—the regularly available types and some specially synthesized tape for experimental purposes by the manufacturer. In addition to being used in the animal experiments mentioned, the tapes were tested for absorbability by introducing samples of them into the peritoneal cavities of rats and leaving them there for a month. They were also subjected to sterilization by means of autoclaving.

When the sixteen surviving rabbits were examined, from 1 to 5 weeks after operation, none showed signs of intraperitoneal bleeding or visible residues of the tape. A few showed slight adhesions of the intestine to the liver scar. The liver wounds had healed well. When the hepatic scars were sectioned for microscopic study a small abscess or a caseous residue surrounded by fibrous tissue was the usual finding, apparently representing the unabsorbed components of the tape. The synthetic resins type of adhesive agent had the greatest hemostatic effect. The most satisfactory type of tape, although it was not completely absorbed, was one of polyvinyl alcohol backing, rope stock filler, and adhesive synthetic resins. The tape samples left in the peritoneal cavities of rats were completely absorbed at the end of one month and produced no tissue reaction. All of the tapes were found capable of withstanding sterilization by autoclaving, but some lost varying degrees of elasticity, flexibility, and adhesiveness in the process.

This type of tape has many potential surgical uses, as a hemostatic agent in wounds with diffuse bleeding, and as a simple mechanical method for holding together the ends of severed nerves, tendons, and possibly vessels. Of the requirements for a product that will be suitable for use in humans, namely, complete absorbability, minimal tissue reaction, great adhesive capacity, good hemostatic effect, and susceptibility to chemical and thermal sterilization, some of these have already been attained. The author believes that with continued investigation, the other desired properties can be obtained.

B. F. Lounsbury, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Camiel, M. R.: Roentgenology of the Draining Bronchi from Tuberculous Cavities. *Radiology*, 1946, 46: 24.

The diagnosis of involvement of the bronchi draining tuberculous cavities is, as a rule, based on clinical evidence, bronchoscopic findings, and a few indirect roentgen signs. The author, in studying a rather large number of cases, came to the conclusion that there are also characteristic direct roentgen signs which may be utilized to advantage.

The part of the lung which lies between the hilum and a certain tuberculous cavity contains the regional bronchi and the peribronchial vascular and lymphatic channels which drain the area of parenchymal involvement toward the root of the lung. That the draining bronchi themselves may be involved by the tuberculous process is now generally recognized. Some investigators, as a matter of fact, are of the opinion that they are almost always involved.

The mode of involvement of the bronchi is not clear. There are several theories for its explanation. The author believes that it is the result of direct extension from the cavities they drain by implantation from the infected material.

The roentgen appearance of involvement of the draining bronchi depends on the severity and duration of the underlying tuberculous process. In the early stages the edema or slight inflammation of the bronchus is reflected in a simple increase of the bronchial shadow. The often observed rapid clearing up of such a shadow suggests either a nonspecific process or a very minimal tuberculosis. Later, submucous extension develops with elevation of the bronchial mucosa and thickening of the bronchial wall. At this stage roentgen study reveals two closely related, dense, parallel lines, separated by a central shadow caused by the lumen. Tomography is of great help in bringing out this feature of the roentgen appearance. Still later, ulceration develops and is associated with an irregular granulomatous growth above the surface. Such a process is identified on the roentgenogram by a dense irregular widened bronchial shadow with an irregular narrowing of its lumen. A peribronchial reaction may also be present.

At times one may not be able to outline the bronchus clearly, but even so the shadows between the cavity and the hilum are attributed to the involvement of the draining bronchi. With continued advance of the tuberculosis the ulcerogranuloma completely occludes the bronchus, which leads to peripheral atelectasis. Finally, caseation sets in with necrotic bronchitis, and gives rise to very thick bronchial and peribronchial shadows. The clearing of the extensive disease is reflected by a reversal of the roentgen findings until a gradual return to normal is reached, although the fibrous residua may leave their marks indefinitely. T. LEUCUTIA, M.D.

De Balsac, R. H., and Pannier, R.: Cardiovascular Radiokymography; Its Usefulness and Its Future (La radiokymographie cardiovasculaire; son utilité et son avenir). *Rev. belge sc.med.*, 1945, 16: 1.

Radiokymography offers two ways of picturing the movements of the heart and the great vessels. In the first a screen with horizontal slits is interposed between the thorax and the photographic plate. The screen is slowly moved down vertically till the whole plate has been exposed. A picture of all parts of the heart in various phases is thus obtained. In the second method, the screen is stationary and the plate is moved till fully exposed. The resulting picture shows the movements of particular areas of the heart in its various phases. The kymogram enables us to distinguish clearly between moving and nonmoving contours.

The clinical importance of this diagnostic method is still open to question as the interpretation of the kymogram presents considerable difficulties. However, valuable contributions seem to be possible in cases of coarctation and stenosis of the aorta, in localization of foreign bodies in the wall of the heart, and in valvular diseases. This article deals especially with the radiokymographic findings of myocardial infarcts, and the systolic dilatation of the left auricle in mitral disease. WERNER M. SOLMITZ, M.D.

Hendelberg, T.: The Roentgenographic Examination of the Ankle Joint in Malleolar Fractures. *Acta radiol.*, Stockh., 1946, 27: 23.

A number of different studies of the mechanism of various ankle fractures and dislocations and of their anatomical basis are loosely linked together in this article, the material being mainly from the author's thesis on fractures of the posterior margin of the tibia.

Some of these investigations may be summarized as follows:

1. *Purpose of the investigation.* The determination of the origin and insertion of the anterior tibiofibular ligament, and of its relation to the common oblique fracture of the tibia.

Method. Radiography of an anatomical preparation in which the ligament was marked by a wire.

Findings. This type of fracture often reaches below the insertion of this ligament. If the malleolus can be displaced laterally by manipulation, the ligament is invariably torn even if the fracture does not reach below the ligament.

2. *Purpose of the investigation.* Study of the lateral and medial malleolar ligament insertions for better understanding of the arthrograms.

Method. Radiography of an anatomical preparation from which the posterior joint capsule was removed.

Findings. The medial ligament inserts on the astragalus at the level of the distal part of the trochlea tali. The lateral ligament inserts at the level of the subtaloid joint.

3. *Purpose of the investigation.* Study of the injuries to ligaments caused by malleolar fractures.

Method. Manipulation of fractured ankles under fluoroscopic control.

Findings. In 31 of 42 cases examined a tendency toward dislocation was observed. The dislocation could be produced by pronation-abduction in 24 cases, by supination-adduction in 2, by supination in 2, and by uncertain or unidentified motion in 3 cases.

4. *Purpose of the investigation.* Comparison of the mobility and "dislocatability" of the injured ankle with that of the uninjured one of the same patient.

Method. Manipulation under fluoroscopic control.

Material. Approximately 250 cases with fresh or old (follow up) ankle injuries.

Findings. Only one control ankle displayed a slight instability of the talus. No instability of the talus in plantar flexion was observed in any control ankle, although it had been described as a normal feature by many anatomists.

Conclusion. A mobility of the talus which permits widening of the talofibular space under manipulation is pathological.

5. *Purpose of the investigation.* Correlation of the fluoroscopic findings in 4 to specified ligament injuries.

Method. Arthrography by means of injection of 3 c.c. of perabrodil into the joint.

Material. Same as in 4.

Findings. In 15 of 16 cases in which the attempt at dislocation of the injured ankle failed or in which the fractured malleolus accompanied the talus in dislocation, no leakage of contrast material occurred. In 9 of 10 cases with gross abnormal mobility of the talus, leakage was clearly observed.

Failure of contrast material to escape into the surrounding tissues in some cases of abnormal "dislocatability" was probably caused by blood clots because it occurred in cases in which the examination was performed 24 hours after the injury or later. Nonleakage in cases of abnormal mobility not exceeding 1 or 2 mm. (observed in a few instances) is probably explained by stretching of the capsule without rupture.

6. *Purpose of the investigation.* Determination of the roentgenographic visibility of the widening of the tibiofibular space (which is said to occur in many ankle injuries).

Method. Insertion of wooden wedges between tibia and fibula.

Findings. The widening cannot be seen on regular anteroposterior ankle films because of the obliquity of the contours. Escape of contrast material along the interosseous membrane sometimes indicates this.

Conclusion. Fluoroscopic manipulation and arthrography are necessary for the x-ray diagnosis of rupture of the tibiofibular ligament.

7. *Purpose of the investigation.* Determination of how tilting or dislocating the talus influences the tibiofibular ligament and space.

Method. Postmortem experiments and the testing of 1 case in vivo.

Findings. Dislocation of the talus does not widen the tibiofibular space.

8. *Purpose of the investigation.* Evaluation of the roentgenographic visibility of posterior tibial fragments.

Method. Postmortem experiments with artificial fractures and clinical roentgenographs of 160 cases.

Findings. Only in 27 of the 160 cases were the fragments clearly outlined.

Conclusion. Films of the ankle in oblique posterolateral projection should be taken in all cases of ankle injury.

Further studies concerning fractures of the malleolar arches are discussed in detail.

GERHART S. SCHWARZ, M.D.

Overgaard, K.: On Bechterew's Disease from the Roentgenological Point of View. *Acta radiol.*, Stockh., 1945, 26: 185.

The author briefly reviews the pathology of ankylopoietic spondylarthritis, or Bechterew's disease, and stresses its frequently insidious onset, its predilection for young adult males, the pain in the spine with gradual development of poker spine, especially in the lumbar region, fixation of the ribs, and later involvement of the joints of the extremities.

He points out that the few cases reported as coming to autopsy relatively early in the disease process have shown an inflammatory arthritis first affecting the small intervertebral joints, which ultimately results in fibrous and then bony ankylosis, with accompanying deposition of bone in the vertebral ligaments. Whereas the state of the sacroiliac joints is not mentioned in these early autopsies, the author believes there is roentgen evidence pointing to similar early involvement of these joints, which is much more easily recognizable in films than in the small intervertebral joints where such changes can at best be brought out only with a careful search of special oblique views.

He bases his opinion on a study of 31 personally observed cases (28 males and 3 females) and gives the roentgen details in 8 of these cases. Early in the disease there were scattered opacities in bone about the sacroiliac joints with slight, spotty decalcification of subchondral osseous tissue and blurring of the articular surfaces. Confluence of the small rarefactions may result in an apparent increase in cartilage space. As decalcification spreads in some areas, sclerosis increases in others, and bony bridges begin to cross the articular interspace. Gradually this process progresses until the joint architecture is effaced by osseous ankylosis.

He also calls attention to the fact that although the fibrocartilaginous tissue in the center of the discs degenerates as the disease progresses, the vertebral interspaces usually do not become narrowed, as

in simple fibrous degeneration, probably because by the time this change intervenes the distance between the vertebrae has become fixed as a result of articular and ligamentous change, manifested in the roentgenogram by intervertebral bridging and not to be mistaken, in the author's opinion, for the long osteophytes often seen in ordinary osteoarthritis.

After reviewing the results of roentgen therapy in this disease as reported in the literature, the author relates his own experience in the treatment of 15 patients with rather severe cases, who also received intensive medicinal and physical therapy. Irradiation was given over the sites of pain, with special attention to joints in which it was important to maintain mobility, such as the cervical and atlanto-occipital joints, and those of the hip and shoulder. Single doses of from 150 to 200 r. (180 kv., 1 mm. of copper plus 1 mm. of aluminum), repeated once to a given field, or one dose each to an anterior and posterior portal, constituted the usual course, and if a satisfactory effect was not obtained the course was repeated after from 3 to 6 weeks. A considerable analgesic effect was obtained in all cases, and as a consequence patients were able to tolerate more active physiotherapy. A follow-up of 10 cases after from 1 to 4 years showed that the gains made had been maintained in all but 1 incompletely treated case. The patients had little pain, and mobility in the joints of the extremities was good enough to permit them to work. LILIAN DONALDSON, M.D.

Nielsen, J.: Roentgen Treatment of Malignant Tumors of the Nasopharynx. *Acta radiol.*, Stockh., 1945, 26: 133.

The author reports his experience with 77 cases of malignant nasopharyngeal tumors, 75 of which had been examined histologically. This represents the total number of cases of this kind referred to the Radium Center in Copenhagen from 1931 to 1941, and 0.75 per cent of all malignant affections treated in this institute over this period. Several histological classifications in the examined tumors are given, one of which is as follows:

Lymphoepithelioma	22 cases
Reticulosarcoma	13 cases
Lymphosarcoma	7 cases
Basal cell carcinoma	12 cases
Squamous cell carcinoma	20 cases
Cylindroma (cylindrocellular carcinoma)	1 cases
Not examined	2 cases

All cases were treated with x-rays exclusively in fractionated doses to two lateral portals (including the base of the skull and the neck) and usually to two additional frontal portals with the eyes protected. As a rule, two treatments were given per day. The single treatment dose varied between 75 and 200 r./air. In most cases the radiation was a heavily filtered (Thoraeus filter) 180—200 kv. beam. The target skin distance was between 50 and 70 cm. and the intensity varied between 2.5 and 7.5 r./air per minute. The tumor doses as stated in the case histories (not all of the cases are reported) ranged from 1,800 r. to 5,400 r. Additional treatments were given to recurrences and metastases.

The results in the 37 cases which were treated up to 1936 were as follows:

TABLE I.—ROENTGENOLOGICAL RESULTS IN 37 CASES OF NASOPHARYNGEAL TUMOR OBSERVED FROM 1931 TO 1936.

Symptom-free after 5 years	9 (24 per cent)
Alive with recurrence after 5 years	2 (5 per cent)
Died within 5 years	26 (71 per cent)
	37

TABLE II.—FIVE-YEAR RESULTS OF ROENTGENOLOGICAL TREATMENT IN 37 CASES, IN RELATION TO THE HISTOLOGIC TYPE OF THE NASOPHARYNGEAL TUMOR.

Lymphepithelioma	4 of 15	Sarcomas: 7 of 25 (28 per cent)
Reticulosarcoma	2 of 7	
Lymphosarcoma	1 of 3	
Basal cell carcinoma	2 of 2	Carcinomas: 2 of 11 (18 per cent)
Squamoepithelial carcinoma	0 of 9	
No microscopy	0 of 1	

Sixty-seven of the 77 patients either had lymph node metastases when they were first seen or they developed them after the treatment. In 25 cases distant metastases could be demonstrated with certainty in one or more of the following locations: bones (12 cases), mediastinum and lungs (8 cases), liver (3 cases), and abdominal glands (7 cases). The author concludes: (1) that roentgen therapy is at present the method of choice; (2) that supplementary intracavitary treatment will probably not improve the results since the dose distribution is adequate; and (3) that in cases of lymphoepithelioma the necessary tumor dose depends on the treatment time. It rises with the treatment time, e.g., it is only 3,000 r. if given in 20 days, but 5,100 r. when protracted over 60 days.

The symptomatology, diagnosis, and clinical management of nasopharyngeal tumors is discussed extensively. GERHART S. SCHWARZ, M.D.

Jensen, A.: Dose Measurements in Roentgen Irradiation of the Female Pelvis. *Acta radiol.*, Stockh., 1945, 26: 99.

The purpose of this investigation is to compare the skin dose-tumor dose ratio as it occurs in the roentgen ray treatment of the parametria following the usual intracavitary radium treatment of uterine carcinoma, (a) if cross firing through 2, 4, or 8 portals is used, and (b) if rotation treatment is applied. In the latter case the patient lies horizontally on a stretcher while the roentgen ray tube moves around the patient.

Three principal arrangements were used for the rotation method: (1) the tube describes a half circle of 180 degrees around the long axis of the patient within several minutes; then the patient is turned

from her back onto her abdomen and the circle is repeated so that a continuous skin belt around the pelvis is exposed to roentgen rays; (2) two complete circles around the patient are described by the tube, the radiation being angulated first toward the feet of the patient, and later toward the head of the patient, which results in 2 x-ray exposed skin belts which cross each other; (3) rotation around 2 paramedian long axes 12 centimeters apart. In this arrangement, only a limited sector is described by the tube around each side of the patient.

The measurements were taken on an anatomical preparation, on a paraffine-dichlorbenzol phantom, and on actual patients. Sievert ionization chambers were used on the surface and within the test objects. An intravaginal thimble chamber of a Siemens dosimeter was used on patients.

The speed of the circling tube was varied. In some experiments it was constant, and in others the tube was purposely slowed up over certain sectors.

The author found that the best dosage distribution and the optimal skin dose-depth dose ratio could be obtained in the third arrangement, and that it was superior to all arrangements of group a. This is explained by the fact that the uterus received an adequate dosage from the radium treatment alone, so that the roentgen radiation should be concentrated to either side of the uterus in the parametria. The measurements for all tested arrangements are given. GERHART S. SCHWARZ, M.D.

Robbins, L. L., Aub, J. C., Cope, O., and Others: Superficial "Burns" of the Skin and Eyes from Scattered Cathode Rays. *Radiology*, 1946, 46: 1.

The authors' report is concerned with varying degrees of injury received by 6 men at the Massachusetts General Hospital, Boston, as a result of exposure, for a few seconds, to scattered electrons from a 1,200 kv. electrostatic generator.

The effect of exposure to cathode rays in the direct beam was known, but the effect of scattered cathode rays was not understood. Previous workers have observed clinically and experimentally that the effects of cathode and roentgen rays are similar, except that the former have a definite and limited depth of penetration without underlying reaction. The energy involved in cathode rays is many times greater than that of roentgen rays. This is readily understood when it is realized that in the production of the latter, probably only 0.5 per cent of the energy of the electron stream is converted into roentgen rays.

On December 1, 1944, in the supervoltage treatment room, the target had been removed from the tube of the 1,200 kv. electrostatic generator, and the cathode ray window inserted. This was necessary to correct the focal point as to size and location. The danger from the direct beam was known, but it was thought that if a reasonable distance were maintained, there could be no great danger for a short period of time. Consequently, 6 men entered the room while the machine was in operation. The machine had been running no longer than 2 minutes, and each man stood at least from 3 to 5 feet or more away from the central beam and at right angles to it. At one point all of them leaned down, and for 5 seconds or less looked up at the cathode ray window to observe its fluorescence.

Following the accident it was realized that approximate ionization measurements should be obtained in order to estimate the dose and depth of penetration of the irradiation received by those who were in the room. The source of radiation was a vertical 1,200 kv. cathode ray beam emitted through an 0.005 cm. thick aluminum window in the tube, which was 175 cm. above the floor. It was previously known that the maximum range under these conditions is 5.4 mm. in water and probably 450 cm. in air. The beam current was estimated at about 50 microamperes. To obtain the ionization dose expected in the tissue of those who were irradiated, measurements of the ionization intensity in a phantom were made. The Victoreen R meter gave approximately the same readings. It was estimated that those who stood 100 cm. from the cathode post for 20 seconds received a skin dose of about 1,000 r. on their faces and 2,000 r. on their hands. The dosage to the feet would be greater, but this region was well protected by clothing. The measurements also show that the effects will be limited entirely to the first 3 mm. below the surface and will be greatest in the first mm. The effect of cathode rays and of roentgen rays may be similar in regions receiving the same ionization dosage; however, the distribution of energy absorption in the body from cathode rays is very different from that of roentgen rays.

The exposures to cathode rays produced burns which were analogous to but different from sunburn, thermal burns, and roentgen ray burns. The primary reaction was prompt in appearance and was like a very intense sunburn but was not followed by tanning. There were early signs of irritation to the conjunctivae. The first phase lasted from 5 to 7 days.

The secondary phase occurred in from 10 to 12 days after exposure and was characterized by pain of the face and nailbeds, followed by a second increase in redness and edema of the involved parts. The edema was limited to the skin, and in the 3 severe cases bleb formation occurred. In the 3 milder cases the pain and edema disappeared after from 5 to 7 days, and the patients suffered no further symptoms.

The 3 severe cases exhibited a tertiary phase in approximately 4 weeks after exposure. They showed new areas of involvement, appearing at varying intervals, in parts which had been protected by clothing, and these followed the same characteristics as the primary phase—some going on to pigmentation, edema, bleb formation, and even whole thickness skin destruction. Several older areas which had healed broke down for a second time. The most severe case which developed full thickness skin loss from the blebs that started in the secondary phase became more extensive and ruptured. The transudate from the wounds became purulent, and bacteria typical of normal skin flora were obtained.

Penicillin proved effective in controlling this complication. Grafting was necessary to heal this skin defect.

In contrast to thermal burns, there was an absence of subcutaneous edema, which suggests a superficial effect and therefore absence of damage to the capillaries. None of the lesions involved tissues deeper than the dermis.

In comparison with severe roentgen ray reactions, the cathode ray reactions became manifest much sooner and caused decidedly less pain. Their periodicity is unique. They exhibited temporary lulls during which beginning healing was evident.

The late effects are somewhat similar to roentgen ray reactions, but what the final changes may be is still unknown.

An excellent clinical description is given of the cathode ray burns and protocols, and the article is accompanied by colored photographs showing the progress of the cases. HARVEY S. ALLEN, M.D.

RADIUM

Medical Officers of the First, Third, Eighth, Twelfth, and Fifteenth Air Forces: The Use of Radium in the Aerotitis Control Program of the Army Air Forces. *Ann. Otol. Rhinol.*, 1945, 54: 650.

The medical officers of 5 Air Forces participated in the preparation of a report on the use of radium in the Aerotitis Control Program. The organization of the program began in May, 1944 when the Air Surgeon assigned 10 otologists to the Johns Hopkins Hospital, Baltimore, to be indoctrinated, under the guidance of Samuel J. Crowe, in the problem of aerotitis and its possible control by the radium treatment of lymphoid hyperplasia about the pharyngeal ostia of the eustachian tubes. These otologists were then sent to the various Air Forces, some stationed in the United States, others operating in the theaters of war where they actually carried out the work.

The Program became necessary because of the fact that a great number of airmen had been incapacitated by the aerotitis, which interfered seriously with the efficiency of the Service. In referring to the overseas situation in the years 1943 and 1944, one Air Force Theater Surgeon stated: "In the end, these men take up a lot of time of the Unit surgeons, occupy hospital beds, and are not available for combat duty a third of the time."

The term "aero-otitis media" was coined in 1937 by Armstrong and Heim, who defined the condition as an acute or chronic traumatic inflammation of the middle ear due to improper ventilation during flight. Normally, equalization of pressure between the middle ear and the surrounding air is accomplished by swallowing, yawning, or other acts which cause the eustachian tubes to open at regular intervals. Certain predisposing factors, the most common of which is lymphatic hyperplasia in and around the pharyngeal ostia of the eustachian tubes, however, prevent such an equalization of the pressure. The result is that the eustachian tubes become completely blocked, and cause pain, tinnitus, and deafness of varying degree and duration. This occurs especially during changes in barometric pressure associated with rapid descent. In severe cases, fluid or blood may accumulate in the tympanum and occasionally the drum may perforate.

Otoscopic examination reveals retraction and congestion of the tympanic membrane, and often hemorrhage into its layers. Nasopharyngoscopic examination shows that in the majority of such cases there is evidence of excessive lymphoid hyperplasia in the fossa of Rosenmueller, in and around the pharyngeal orifice of the eustachian tube, or in the area between the tubal orifice and the posterior end of the middle turbinate.

Because of this striking correlation between the lymphoid hyperplasia and the incidence of aerotitis in the airmen, it was decided to try to destroy the lymphoid hyperplasia, not only in the men who had already developed a chronically recurring aerotitis but also, if possible, in all those in whom the location and amount of lymphoid hyperplasia would indicate a predisposition to aerotitis. The Air Surgeon authorized the use of radium as the most efficient means of destroying the lymphatic hyperplasia.

The following technique was recommended:

Two nasopharyngeal radium applicators, each containing 50 mgm. of radium sulfate, are introduced simultaneously along the floor of the nose, one on each side. The applicator consists of a radium-containing chamber and a wire handle. The chamber is made of monel, 2 cm. long, has an outside diameter of 2.3 mm., an inside diameter of 1.7 mm., and a wall thickness of 0.3 mm. The chamber is brazed to the wire handle to prevent the possibility of its being broken off and swallowed or aspirated. In the beginning the exposure was for 6.6 minutes, giving a dose of approximately 1 gm., 20 seconds. Later, the exposure was increased to 8.5 minutes, leading to a dose of 1 gm. 25 seconds. With the 0.3 mm. monel filter, the radium source emits 30 per cent beta rays and 70 per cent gamma rays. Whenever possible, 3 applications are made at intervals of from 25 to 30 days.

Treatment should not be given in the presence of an acute upper respiratory infection. In subacute infection, the dose is split into two equal fractions, given 5 days apart. Special care must be taken not to bend or break the applicator since the escape of radon would render the radium useless as a source of irradiation. It is also necessary to observe strict protective measures for the personnel giving the treatment. The best protection being distance, the treatment rooms should be at least 20 feet away from the examining rooms. The applicators must be handled as briefly as possible. To clean them, a soft brush is fastened to the sink and they are rubbed against this brush.

To secure comparable results, the Air Surgeon devised standard methods of history taking, of examination, of interpretation of findings, and of treatment.

The First Air Force was located in the United States. The program was conducted by Hendricks, Lieberman, Lyman, McMurray, Magnuson, and Weymuller. There were two Irradiation Clinics, one at Westover Field, Massachusetts, and the other at Mitchell Field, New York.

During the period from September 10, 1944 to June 1, 1945, Hendricks and Lieberman, after examining 3,525 airmen in combat crew training at Westover Field, found an incidence of 44.3 per cent of lymphoid hyperplasia in and around the eustachian tubes, which required treatment. A past history of aerotitis was two and a half times as frequent in the men who were treated as in those who were rejected for treatment. In a group of 778 airmen, it was possible to extend follow-up observations to 30 days or more after 3 treatments were given. Of these, 90 per cent showed a definite reduction in the amount of lymphoid tissue, as compared to that found at the original examination. In 54 per cent of the men there was subjective improvement. Upon completion of treatments, the incidence of aerotitis in the treated men became practically identical with that of the group who were rejected for treatment.

Weymuller and Magnuson, during the same period, treated 52 cases of recurrent aerotitis at Mitchell Field. Only 8 cases failed to respond, the most frequent causes of failure being allergy, chronic sinusitis, vasomotor rhinitis and sinusitis, and frequent colds.

The Third Air Force likewise was stationed in the United States. The program was conducted by Gleuber, Smith and Earl. There was one Irradiation Clinic established at Drew Field, Florida. In this Air Force, 1,177 flying persons were treated. In 381 cases, a good follow-up was obtained. The subjective improvement amounted to 54.4 per cent after the first treatment, and 90.5 per cent after the second treatment. Objective improvement was noted in 95.2 per cent after the second treatment. Unfortunately, no observations could be made after the third treatment but it is presumed that the final results must have been even higher. The most frequent causes of failure were grossly hypertrophied adenoids, recurrent colds and nasopharyngitis, and permanent defects either in the tympanic membrane or in the nose.

The Eighth Air Force was located in England, from where it operated over the continent. The Aerotitis Control Program was conducted by 3 medical officers, one attached to each division: Eschenbrenner, Jr. to the First, Collins to the Second, and Lyle to the Third Division.

The period of examinations and treatments was from November 1, 1944 to February 14, 1945, but some follow-up studies were continued until June 1, 1945. A total of 1,124 men with aerotitis were examined. Of these, 977 were bomber personnel and 147 were fighter pilots. Treatment was given in 404 cases and a group of 66 untreated cases were used for control. A subjective improvement was noted in 58.3 per cent of the men after the first treatment, in 77.0 per cent after the second treatment, and in 78.2 per cent after the third treatment. The corresponding objective improvement was 78.4 per cent after the second and 94.6 per cent after the third treatment. It was noted that persons with repeated groundings for aerotitis had a high incidence of air difficulty in the decompression chamber.

The Twelfth Air Force operated through Corsica, northern Italy, France, and Germany as a very highly mobile unit. The Aerotitis Control Program was entrusted to Mikell who, during a few months, had to cover with his Irradiation Clinic 20,000 miles by air and 5,000 miles by land, using every imaginable vehicle for transportation. From December 21, 1944 to April 21, 1945, Mikell examined 704 men of whom 394 received treatment. It was possible to follow up 162 men 30 days after the third treatment. The final results showed 89 per cent of subjective and 80 per cent of objective improvement.

The Aerotitis Irradiation Clinic of the Fifteenth Air Force was in charge of Trapasso, who travelled between bomb groups by jeep and trailer. From November 9, 1944 to April 21, 1945 Trapasso examined 1,580 men and treated 1,002 men. However, because of the rapid turnover of personnel, only 91 men could be followed up 30 days or more after the third treatment. The subjective improvement amounted to 44 per cent after the first, 64 per cent after the second, and 81 per cent after the third treatment, whereas the objective improvement was 76 per cent after the second, and 98 per cent after the third treatment.

A tabulation of all the available data from the five Air Forces indicates that a total of 14,345 men were examined by the participating units and 6,881 were selected for treatment. A total of 14,045 treatments were given without a single instance of burn or ulceration. The only reaction noted by a small proportion of the men was a mild stuffiness of the nose or a slight sore throat.

The final conclusion is drawn that radium, by destroying lymphoid hyperplasia in and around the pharyngeal orifices of the eustachian tubes, is of definite value in aerotitis, not only as a curative agent but also as a prophylactic measure.

T. LEUCUTIA, M. D.

MISCELLANEOUS

Reynolds, L.: Newer Investigations of Radiation Effects and Their Clinical Applications; Pancoast Lecture. *Am. J. Roentg.*, 1946, 55: 135.

The mechanism of the reaction which occurs when a patient is treated with a beam of radiant energy has been an intriguing problem from the earliest days of radiation therapy. A worth while theory was not advanced until 1922 when Dessauer published his "point heat hypothesis." According to this theory the absorption of radiation is discontinuous, the energy ultimately becoming concentrated in a few discrete entities within the cell. Only the energy in the form of heat liberated at these points was thought

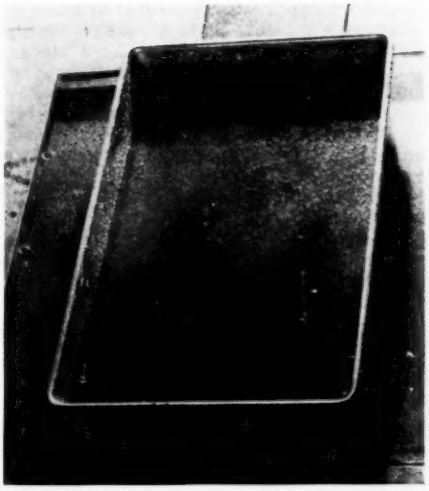


Fig. 1. This shows a monomolecular layer of lipoid material prepared on the surface of water and exposed to only 600 r. of 550 kv. radiation. In this case the radiation enters through the bottom of the thin aluminum pan and passes through a 2 cm. layer of water before it hits the monolayer. In this way, the beam is brought to equilibrium with its secondary electrons. It can be seen at once that the beam, which entered through a small square portal under the pan, has imprinted itself clearly on the monolayer on top of the water.

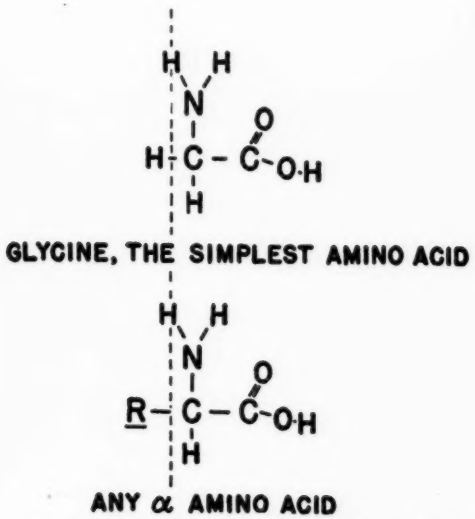


Fig. 2. This shows the form of some of the amino acid groups of which these large protein molecules are built. The simplest one, of course, is alpha amino acetic acid (glycine). In the chart the hydrophilous groups are to the right of the line drawn vertically through the molecular formulas. A number of very interesting things about these hydrophilous groups are immediately apparent. In the first place, every alpha amino acid has both a negative and a positive group attached to the same carbon atom on the end of a hydrocarbon chain. Some of the more complicated ones also have either a positive or a negative one elsewhere in the chain. This gives rise to the familiar peptide linkage by means of which one of these acids can join with another. When we come to consider their solubility in water and their chemical behavior, it is obvious that they will be attracted differentially by acid or basic solutions.

to cause any effect. The "point theory" was modified by Crowther in 1938 and assumes that action takes place whenever a pair of ions are liberated within the sensitive target area. This phenomenon was thought to be due to a "hit" of the biological structures by the radiation. Other investigators interpret a "hit" as the absorption of a photon.

In contradistinction to this discontinuous effect a more generalized action was assumed by proponents of a second theory commonly known as the "poison theory." The poisonous material was produced by radiation of the nucleus, which then produced death or injury of the entire cell. Failla, in 1937, in his 'fluid flow theory" assumes a general effect through change in the ratio of the "radio ions" and the photochemical products on the two sides of the cell membranes. This creates a change in the fluid flow which leads to alteration of the cell properties.

The author, in his experiments, directs attention to certain physicochemical reactions which may influence the equilibrium between the intracellular and extracellular medium, as well as the function of the intervening cell membrane.

The osmotic pressure of a solution of 1 per cent egg albumin was studied after irradiation with 12,000 r. at 550 kilovolts. The osmotic pressure was increased to 78 per cent and was proportional to the dosage administered. The osmometer developed by the author is a modification of the one designed by Fazer and Myrick. Details of its construction are given. A second osmometer was built according to the plans of Bourdillon, a special membrane material of protein composition being used. The results with this instrument were the reverse of the previous findings. Upon analysis it was found that the membrane had become permeable to the breakdown products of the albumin, and the osmotic pressure had been lowered. An analogy was drawn from these results to the biological effects observed in a dog's brain after x-radiation. One part of the brain showed rather marked intracellular edema. Another part which had received larger dosage showed marked shrinking of the cells. These shrunken cells were thought to be due, not to rupture of the membrane, but to the passage of small protein fragments through the cell membrane (since the chromatin remained intracellular).

In the second group of experiments a monomolecular layer of unsaturated lipoid material prepared on a surface of water was irradiated with 600 r.

at 550 kilovolts. The beam was directed through a 2 centimeter layer of water. The shape of the emerging square beam can be seen imprinted on the monolayer on top of the water in Figure 1. Further experiments show that greater doses of x-rays were required to produce the same change in a more completely saturated fatty acid. In some cases the surface required ageing to bring about this effect. It has been shown by numerous investigators in the field of physical chemistry that fatty acid molecules in a monomolecular layer will orient themselves at a water-air interface, so that the carboxyl group or polar group is in the water and the hydrocarbon chain or nonpolar group stands erect in the air. In a similar fashion amino acids or proteins are also composed of polar and nonpolar groups and will orient themselves at an interface. Figure 2 is an example of the amino acids in which the hydrophilous or polar groups lie to the right of the vertical line and the hydrophobic or nonpolar groups lie to the left. These oriented monomolecular layers have definite physical properties—they resist cleavage and compression with varying degrees of strength according to their chemical and physical composition.

It has been shown that lipoid substances will combine with protein monolayers. Such a combination probably represents our nearest approach to the cell membranes. These membranes are dynamic complex structures which respond to small physical and chemical changes of environment.

Lecithin, an important constituent of brain and nerve tissue, is a highly polar molecule. Multiple monolayers of lecithin (arranged like a stack of cards) exhibit strong optical properties. These optical properties are destroyed by x-radiation. An analogy is drawn between the loss of optical properties of the multilayers of lecithin and the loss of optical properties of myelin when exposed to x-radiation.

During the past several years the author has investigated the effects of x-radiation on normal dog brain. He found that myelin was comparatively radiosensitive, in contrast with the more radioresistant brain cells. In addition, it was found that brain damage began when the myelinated nerves lost their optical properties (birefringency) even though they retained their outward physical form. The myelin degeneration which follows irradiation in dogs may require as long as one year to become evident.

Three patients presenting brain tumors who had received x-ray therapy demonstrated the same myelin sensitivity as was observed in dogs.

Thus, it is seen that structures which depend for their functional properties on a highly organized system of polar molecules lose their organized structure when bombarded with high energy radiation. The animal experiments show that when structural organization is gone, function is gone with it.

R. B. Lewis, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Harvey, V. K., and Luongo, E. P.: Physical Capacity for Work; Principles of Industrial Physiology Related to the Evaluation of the Working Capacity of the Physically Impaired. *Occup. M.*, 1946, 1: 1.

This report is the third in a series devoted to the United States Civil Service Commission's program for the employment of physically impaired persons.

Examination of a human being to find what work he is fit for involves knowledge of a method not yet possessed by medical science, namely, a method of estimating reserve compensation. Present techniques of measuring job requirements and physical capacities are only reasonable guides. They have value only as guides since there is a substantial margin of error both in the determination of the requirements of the job and in the physical evaluation and selective placement of the applicant. In the final analysis, regardless of what systems of job analysis and of evaluation of working capacity are used, the two most important factors in estimating physical capacity for work are the diagnostic acumen of the examining physician and his knowledge of industrial conditions.

In this connection, the future of the physically impaired in government or private industry will be as good as the type of preventive industrial medical service which management is willing to provide. The future of industrial medicine is closely allied to "human engineering" in the promotion of individual physical and mental hygiene, nutritional guidance, physical training, and the control of fatigue, as well as in the aiding of management in the selection of employees for specific types of work. In this connection, periodic re-examination of employees and jobs probably should be mandatory, especially in the case of the physically impaired.

The "must" in dealing with the applicant for work who presents an impairment, whether he is a veteran or a nonveteran, is to give him a fair chance to make good under his own power plus whatever assistance or special benefits are provided by law—state, municipal, or federal.

The general risk that an employer takes in hiring seemingly normal persons without being able to measure the large number of success factors involved in work is considerable. It may exceed any risk he takes with physically impaired persons whose capacities have been evaluated and matched with the requirements of the job. Mistakes in placing the worker with an impairment are inevitable, as in the case of the able bodied, but the failure of a person with a particular type of defect to do a particular job should not prejudice an employer against considering another person with the same defect for the same job unless it has been definitely substantiated that there is a physiologic or a psychologic contraindication in the requirements of the job. In cases in which there is a doubt whether the remaining capacities of the person with an impaired function are adequate for successful performance of the job, the doubt should be resolved in favor of the applicant, with the understanding that if he does not prove successful in the job, he may be referred to appropriate rehabilitation authorities or reassigned, and that if this is not possible, his employment may be terminated.

WALTER H. NADLER, M.D.

Loehle, J. F.: Oral Plasma Feeding. *J. Pediat.*, S. Louis, 1946, 28: 145.

Many investigators have advised the incorporation of proteins, in some form or other, in neonatal and complemental feedings as the best method to remedy neonatal weight loss. Human milk is not Nature's first food substance of predilection for the human newborn infant, for the human breasts first and foremost provide colostrum. The closest available substance corresponding to colostrum is human plasma, provided the fat content be removed.

With these facts in mind, 7 premature infants were fed orally with a plasma solution in place of any other nutrient substance, and after 24 hours of this type of feeding, plasma was added to the variously constituted neonatal feedings. The object was to reduce the limitations set by employing merely one or two types of neonatal feedings.

In all cases neonatal weight loss ceased, and the infants thrived. Moreover, all of them showed appreciable weight losses when the plasma was subtracted from the feedings. These changes were more conspicuous than those observed in other types of neonatal feedings of high protein content. Intestinal disturbance was absent if the plasma when fed to the infants was free of red cells and suspicious antigens.

ERNEST E. ARNHEIM, M.D.

Slobody, L. B., Benson, R. A., and Mestern, J.: The Induction of Vitamin C Subnutrition. *J. Pediat.*, S. Louis, 1946, 28: 134.

Sixteen children ranging in age from 5 to 11 years were given from 50 to 300 mgm. of ascorbic acid daily until the skin test (based on the intradermal injection of a dye which is decolorized by Vitamin C) and the plasma ascorbic acid levels were within normal range (more than 0.2 mgm. per cent). This was usually accomplished in from 1 to 3 weeks. Then the diet, which contained no citrus fruits or tomatoes, was begun. Before the diet was started, the skin test time was 9 minutes or less in 14 children and 11 minutes in 2 children. The ascorbic acid levels in the blood ranged from approximately 0.5 to 1.9 mgm. During the diet, the skin test time became prolonged beyond 14 minutes in all of the

children. The skin test time was again shortened to normal following the administration of from 25 to 200 mgm. of ascorbic acid per day. During the diet most of the plasma levels of ascorbic acid fell. The blood levels rose following the administration of ascorbic acid.

The children felt well during the entire study and there were no abnormal physical findings. The blood counts and roentgenograms were essentially normal. In 5 cases the serum phosphatase was found to be within normal limits. Gross and some biomicroscopic examinations of the gums revealed some gingival manifestations of vitamin C deficiency, but no attempt was made to evaluate and correlate these findings. ERNEST E. ARNHEIM, M.D.

Karelin, V. M., and Tscharnaya, D. S.: The Treatment of Internal Hemorrhages and Hemorrhagic Diatheses with Vitamin K. *Vrachebnoe Delo*, 1945, p. 11.

Palladin prepared a water soluble vitamin K, which is the sodium salt of methylnaphthohydroquinosulfo acid and is only half as toxic as the alcoholic solution of vitamin K_3 or methylnaphthoquinone.

The authors were able to increase the coagulability of the blood and to diminish the bleeding time in nearly all of their patients by administering one or the other of these mentioned products. Vitamin K was used in the form of an alcoholic or aqueous solution and also in the form of tablets. The drug was administered 2 or 3 times a day for 3 days in succession, each individual dose containing 10 mgm. of the active substance. If the bleeding did not stop after 3 days the treatment was continued for 3 days more.

Vitamin K_3 was found to be very effective in the treatment of pulmonary, gastric, and uterine hemorrhages. In patients with hemophilia the blood began to coagulate earlier than in the control experiments. In icteric patients the administration of vitamin K_3 was followed by a diminution of the amount of bilirubin in the blood. This observation suggests an improvement of the liver function. In patients with gastric hemorrhages, blood disappeared from the feces after the administration of vitamin K_3. In 1 patient with a cancer of the stomach the blood in the feces persisted but the number of thrombocytes rose from 84,000 to 200,000. In patients with Werlhoff's disease, epistaxis and subcutaneous hemorrhages ceased after the administration of vitamin K_3. In all instances the amount of prothrombin increased.

The authors conclude that vitamin K_3 deserves greater use for prophylactic treatment and is also indicated in the therapy of pulmonary, gastric, and uterine hemorrhages. JOSEPH K. NARAT, M.D.

Van Vyne, A.: Prothrombinemia in Hemorrhagic Diatheses and Its Response to Vitamin K. *Rev. belge sc. med.*, 1944, 15: 173.

The different methods of determining the prothrombin level of the blood are discussed. The author prefers the two stage method of Smith, Warner, and Brinkhous which permits a true titration of the prothrombin. Thromboplastin and calcium are added to the defibrinized plasma, which transforms the prothrombin into thrombin. To this mixture fibrinogen is added and the coagulation time taken with increasing dilutions of plasma. The highest dilution which shows coagulation within 15 seconds indicates the prothrombin level.

Large series of tests were done in human beings and animals (dog, rabbit, and chicken). The most significant results were:

1. In normal persons, the prothrombin level is very constant and hardly varies in the same individual. The same holds true for dogs. All values below 80 per cent are to be considered pathological. Hyperprothrombinemia has never been observed as a spontaneous occurrence, but may be produced experimentally by the injection of vitamin K; it is transient and followed by a short period of hypoprothrombinemia.

2. The role of the liver is a double one: (a) resorption and storage of vitamin K of exogenous or endogenous origin (therefore, a considerable decrease of the prothrombin level in biliary obstruction can be corrected promptly by vitamin K treatment) and (b) under the influence of vitamin K, the liver produces the necessary amount of prothrombin. Any damage of the liver causes hypoprothrombinemia. This responds more or less favorably to the administration of vitamin K, according to the functional condition of the liver. Thus, the response to vitamin K can serve as a test to the extent of liver damage. This was shown in cases of portal cirrhosis, icterus catarrhalis, acute hepatitis, and carcinoma. The success of blood transfusions in hemorrhagic diathesis of hepatic origin is based only on the prothrombin content of the transfused blood.

3. In anaphylactoid purpura (Henoch, Schoenlein) and in peptone shock of the dog, sudden hypoprothrombinemia occurs; this responds to vitamin K and seems to indicate a relationship between liver damage and anaphylactoid purpura.

4. The normal newborn shows a marked hypoprothrombinemia of from 25 to 30 per cent; premature infants present even less.

5. Other pathological conditions, like pernicious anemia and severe malnutrition, also reveal marked hypoprothrombinemia.

WERNER M. SOLMITZ, M.D.

Robinson, D. T., McLeod, J. W., and Downie, A. W.: Dust in Surgical Theaters as a Possible Source of Postoperative Tetanus. *Lancet*, Lond., 1946, 1: 152.

Tetanus following surgical operations is relatively rare, although in civilian practice almost 10 per cent of more than 3,000 cases of tetanus reviewed by Wainwright in 1926 were postoperative. It is usually impossible to prove the source of infection in these cases, although various materials have been incriminated on circumstantial evidence. Catgut has

often been blamed, and occasionally the evidence for this has been strong (Mackie, 1928). Imperfectly sterilized dressings and instruments, the skin at the operation site, and sulfonamide powders have also come under suspicion. Toxigenic tetanus bacilli have been found in human feces by various observers, although the incidence of this apparently varies in different countries and different communities, and the intestinal tract of the patient has therefore been regarded as the source of infection in abdominal or gynecological operations (Tulloch, 1919).

Tetanus bacilli are often present in soil and street dust from which wounds due to accidents may become infected. Dust in hospital wards or operating theaters has not often been seriously considered as a possible source of tetanus infection of operation wounds, but the observations made in relation to the 2 cases reported indicate that this possible source should not be overlooked.

Steps should be taken to exclude as far as possible infected dust from operating theaters. This would involve, among other measures, the wet dusting of operating theater floors and walls with antiseptic solutions, the filtering of the air coming into the theater through ventilating shafts, and precautions against the introduction of infected dust on the footwear of theater personnel. This last measure might be effected by insisting that at some point in the corridor sufficiently remote from the theater everyone entering should put on gumboots or some equivalent which had been left standing in a potent antiseptic solution. JOHN E. KIRKPATRICK, M.D.

Bachman, A. L., and Bershon, A. L.: The Roentgenographic Appearance of Temporomandibular Hydrarthrosis. *Radiology*, 1946, 46: 251.

The roentgenographic diagnosis of effusion into the temporomandibular joint has only rarely been reported. A comprehensive review of the literature revealed a single case record.

Effusion into the temporomandibular joint has been reported as occurring in a variety of conditions. These have been grouped as (a) traumatic arthritis, (b) rheumatoid arthritis, and (c) suppurative pyogenic arthritis.

While effusions in the temporomandibular joint have been noted as occurring in such conditions, a careful search through the literature revealed no reports other than the report of Bishop, in which the diagnosis of hydrarthrosis was made by x-rays.

A considerable similarity of symptoms exists in cases of acute hydrarthrosis and of dislocation of the temporomandibular joint. There is severe pain and tenderness in the temporomandibular region associated with marked limitation of mandibular movement in both. Roentgenographic examination appears of major importance in the differentiation between effusion and condylar luxation. The necessity for excellent roentgen demonstration of the joint in several views is therefore apparent.

The diagnosis of temporomandibular joint effusion led to conservative treatment with heat and rest, as in any other acute hydrarthrosis. The rapid recovery observed clinically and roentgenographically was strong evidence in substantiation of the diagnosis.

Fig. 1. Appearance of patient on admission. Note protrusion of the lower jaw forward and to the left.

The cause of the effusion in this patient was uncertain. Two possibilities appear most worthy of consideration, the others being more or less excluded by the short course of the illness. Although the patient gave no history of any excessive movement of the jaw, the possibility exists that he may have unconsciously moved his mandible into an abnormal position during sleep. The second possibility is that the hydrarthrosis was an early manifestation of rheumatoid arthritis and that other joints may become involved at a later date.

HARRY W. FINK, M.D.

DUCTLESS GLANDS

Albert, A.: The Experimental Production of Exophthalmos in the Fundulus by Means of Anterior Pituitary Extracts. *Endocrinology*, 1945, 37: 389.

Experimental hyperthyroidism has been produced in many animals by the injection of hypophyseal extracts. Hyperthyroidism with exophthalmos could be produced in ducks, guinea pigs, and also in the fundulus, the common Atlantic "minnow."

Healthy specimens of fundulus heteroclitus, Linn., measuring from 3 to 4 inches in length were kept in a stock tank of running tap water. Impure preparations of both follicle stimulating hormone

Fig. 1. Two exophthalmic fish (left and right) 12 hours after a single injection of sheep anterior pituitary extract. Normal fish in the center for comparison.

(F.S.H.) and the luteinizing hormone (L.H.), obtained from whole pituitary glands of sheep, were injected through the cloaca into the peritoneal cavity. As early as 3 hours after a single injection, exophthalmos was noticed with a maximum demonstration on the second or third day after a single injection. The exophthalmos lasted about 2 weeks and the eye balls then reverted to normal.

Protein from other sources did not produce exophthalmos, nor did other hormonal substances including thyroid and thyroxine. Exophthalmos was produced only by a pyridine extract of sheep pituitary, by the F.S.H., L.H., and thyrotropic hormones. A rapid method of preparing the exophthalmic factor (E.F.) was devised by precipitation with ammonium sulfate, and following dialyzation and centrifuging. The resulting clear solution contained 2 gm. eq. per cubic centimeter, or about 40 E.F. units per cubic centimeter.

Relation of the thyroid to exophthalmos. Although it was shown that thyroid hormone did not produce exophthalmic reaction, it was of interest to determine if any changes occurred in the thyroid during exophthalmos production. Although exophthalmos was definite at 3 hours after injection, no changes in the thyroid were noticed at that time. Six hours following the injection, increased vascularity of the thyroid was noticed. Twenty-four hours after the injection, reduction and vacuolization of the colloid was noticed, vascularity was maximal, the follicular cells were taller, and the nucleus was found to be closer to the base.

The mechanism of exophthalmos. On histological examination, a large triangular shaped edematous mass containing a few leucocytes and lymphocytes, was found within the retrobulbar space. An increased amount of free fluid could be aspirated by puncture of the conjunctiva, following which the proptosis disappeared. The amount of this aspirated fluid was 0.05 c.c. as compared with 0.01 c.c. obtainable from the normal fundulus, and the fluid was under pressure.

If a drain was inserted into the retrobulbar space of one eye, or the dorsal half of the conjunctiva was slit so that fluid could escape, no exophthalmos developed after the injection of E.F. in this eye, while the other eye showed exophthalmos. The injection of saline solution directly into the retrobulbar space produced only transitory exophthalmos, for about 18 hours, which indicated that the orbital tissues could absorb artificially instilled retrobulbar fluid. However, if pituitary extract was injected the exophthalmos might last for more than a week, which showed a direct action on the orbital tissue. The production of exophthalmos by pituitary extract was not affected by section of the sympathetic chain, by anesthesia, or by hypophysectomy.

It is assumed that in the fundulus the pituitary principle acts directly on the orbital tissue, causing edema and cellular infiltrations of the areolar and fat tissue, as well as of the muscles and conjunctiva, and forming free retrobulbar fluid. The accumulation of fluid exerts pressure on the posterior surface of the eyeball which thrusts it out of the orbit as soon as the pressure overcomes the inward pull of the extraocular muscles. Remission of the exophthalmos in the fundulus is believed to be due to absorption of the fluid.

ARTHUR J. LESSER, M.D.